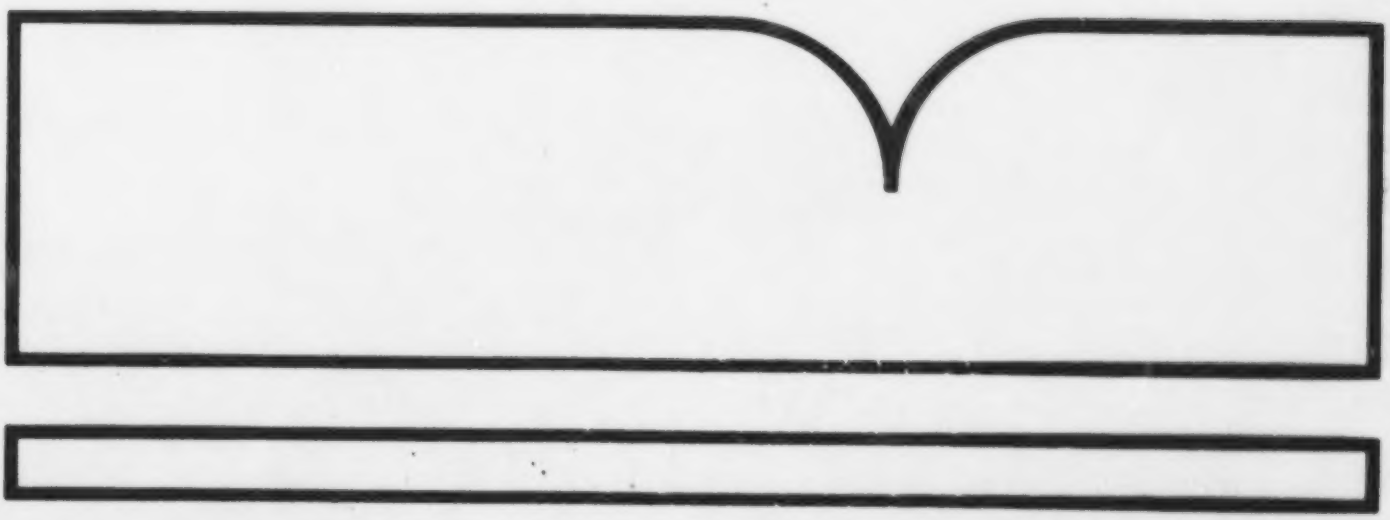
PB85-232155

Superfund Record of Decision (EPA Region 10) South Tacoma Channel, Well 12A, Tacoma Washington, May 1985

(U.S.) Environmental Protection Agency
Washington, DC

3 May 85



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Office of
Emergency and
Remedial Response

EPA/ROD/R10-85/004
May 1985

PB85-232155

EPA

Superfund Record of Decision:

South Tacoma Channel-We11 12A, WA

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1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.
EPA/ROD/R10-85/004		PB85 232155/AS

4. TITLE AND SUBTITLE	5. REPORT DATE
SUPERFUND RECORD OF DECISION South Tacoma Channel - Well 12A, WA	05/03/85 6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS Same as box 12.	10. PROGRAM ELEMENT NO. 11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS U.S. Environmental Protection Agency 401 M Street, S.W. Washington, D.C. 20460	13. TYPE OF REPORT AND PERIOD COVERED Final ROD Report 14. SPONSORING AGENCY CODE 800/00

15. SUPPLEMENTARY NOTES

16. ABSTRACT

The South Tacoma Channel, Well 12A site is in the City of Tacoma, Washington, and includes industrial, commerical and residential areas. Well 12A is one of 13 wells used by the City to meet peak summer and emergency water demands. Research into the past ownership and activities on these properties indicated that waste oil and solvent reclamation processes and paint and laquer thinning manufacturing occurred on the site. As a result of these processes, both the underlying ground water aquifer and portions of the surficial soils show contamination with organic solvents.

The selected remedial action includes: air stripping of the ground water (continue to operate the IRM); extract and treat the ground water at the source to remove volatile organics; drill and sample additional soil test borings during the design phase, remove an appropriate length of railroad track adjacent to the Time Oil property and excavate; perform additional undercutting; install the drain field piping in the excavated areas and cover with a permeable material; pave or place soil cover on the portions of the unpaved Time Oil parking lot; transport and dispose of all excavated, contaminated soils in a RCRA-permitted landfill; maintain institutional controls; monitor ground water and after two years of operation, evaluate the effectiveness of the ground water extraction and treatment system. Total capital cost for the selected remedial alternative is estimated to be $1,590,000, and O&M costs are estimated to be an additional $50,000 per year.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Record of Decision South Tacoma Channel - Well 12A, WA Contaminated Media: gw, soil Key contaminants: 1,1,2,2-tetrachloroethane, 1,2-transdichloroethylene, trichloroethylene, tetrachloroethylene		

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS (This Report)	21. NO. OF PAGES
	None	53
	20. SECURITY CLASS (This page)	22. PRICE
	None	

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

Site: South Tacoma Channel - Well 12A
Tacoma, Washington

DOCUMENTS REVIEWED:

I am basing my decision primarily on the following documents describing the cost-effectiveness of remedial alternatives for the Well 12A site:

- Remedial Investigation/Feasibility Study for South Tacoma Channel, WA, CH2M Hill, July 1984.
- Letter reports, dated January 4, 18 and 23, 1985, by CH2M Hill
- Record of Decision and Supporting Documents for the Initial Remedial Measure, dated March 18, 1983.
- Responsiveness Summary, dated March, 1985.
- Materials provided by the potentially responsible parties and incorporated by reference into the Responsiveness Summary.
- Staff summaries and recommendations.

DESCRIPTION OF SELECTED REMEDY:

- Continue to operate the IRM (treatment of Well 12A effluent) until such time that the source control and remedial measures render the IRM unnecessary.
- Extract and treat the groundwater at the source to remove volatile organics, followed by discharge of a major portion of the treated extraction well effluent into Commencement Bay via an existing storm sewer. The remaining treated extraction well effluent is to be recharged to the aquifer at the source area by means of a drain field in order to provide flushing of contaminants in the soil column.
- During the design phase, drill and sample up to 5 additional 30-foot soil test borings in order to better define the extent of soil contamination.
- Remove an appropriate length of railroad track adjacent to the Time Oil property and excavate the discolored, oily, fine-grained filter cake and soils under and adjacent to the railroad spur. The excavated materials will include the discolored, fine-grained materials mentioned above, plus approximately 1 additional foot of undercut. (The approximate average depth of removal is 6 feet).

- Additional undercutting will be performed in areas where small incremental increases in soil excavation will produce relatively large increases in solvent removal (and hence, reduce the duration of and increase the reliability of the soil flushing process.) The incremental increases in soil excavation will be limited to 15% by volume of the proposed soil excavation.

- Install the drain field piping in the excavated areas and cover with a permeable material to protect the piping and prevent direct human contact with underlying soils.

- Pave or place soil cover on the portions of the unpaved Time Oil parking lot not subject to excavation and flushing, in order to prevent direct human contact.

- Transport and dispose of all excavated, contaminated soils in a RCRA-permitted landfill.

- Maintain institutional controls prohibiting withdrawal of groundwater by private parties in portions of the aquifer where the level of hazard is in excess of 10^{-6}.

- Monitor groundwater consistent with provisions of RCRA and with sufficient detail so as to be able to evaluate the performance of the treatment system.

- After two years of operation, evaluate the effectiveness of the groundwater extraction and treatment system in order to determine the endpoint level of treatment for the groundwater and soil at the source area. The need for capping and other close-out requirements will be determined at this time.

DECLARATIONS:

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA); and the National Contingency Plan (40 CFR Part 300); I have determined that the remedial action consisting of the extraction, treatment, and discharge of groundwater in conjunction with soil removal and flushing at the South Tacoma Channel Well 12A site is the most cost-effective remedy and provides adequate protection of the public health, welfare and the environment. The remedial action includes the maintenance of institutional controls with which to prohibit withdrawals of groundwater from the the area of the plume of contamination, and the selection of the endpoint of groundwater and soil treatment at the source area. Selection of the endpoint levels of treatment is to be done in such a way so as to minimize the extent of the aquifer requiring long-term institutional controls while at the same time, provide a technically feasible and

cost-effective remedy. The levels will take into account the site specific and regional characteristics and will be protective of the public health and the environment. The endpoint levels of treatment are to be evaluated by the Regional Administrator after two years of system operation. The State of Washington has been consulted and agrees with the approved remedy.

The Regional Administrator shall have the authority to approve modifications to the choice and operation of certain aspects of the remedy as discussed in the Summary of Remedial Alternatives Selection insofar as those modifications are equivalent in effectiveness and cost or are necessary for the protection of health or the environment.

In addition, the action may require future operation and maintenance (O&M) activities to ensure the continued effectiveness of the remedy. These activities will be considered part of the approved action and eligible for Trust Fund monies until such time that the Regional Administrator makes the decision regarding the endpoint level of treatment for soils and groundwater. At the time when the levels are set, the Regional Administrator will also decide on the future status and funding of O&M.

I have also determined that the action being taken is appropriate when balanced against the availability of Trust Fund monies for use at other sites. In addition, the off-site transport and disposal of contaminated material from the site is more cost-effective than other remedial actions and is necessary to protect public health, welfare, or the environment.

MAY 3 1985
Date

Jack W. McGraw
Acting Assistant Administrator
Office of Solid Waste and Emergency Response

SUMMARY OF
REMEDIAL ALTERNATIVE SELECTION

SITE: South Tacoma Channel-Well 12A

SITE LOCATION AND DESCRIPTION

The South Tacoma Channel, Well 12A site is in the City of Tacoma, Washington (Figure 1) and includes industrial, commercial and residential areas. The site is within the Commencement Bay drainage area and lies at an elevation of approximately 300 feet above sea level. Both the underlying groundwater aquifer and portions of the surficial soils show contamination with organic solvents.

The approximate area of suspected groundwater contamination is shown on Figure 2 and encompasses about 100 acres. The underlying geology consists of gravel, sand and silts of glacial origin, and is illustrated in Figure 3 which shows a cross section of the aquifer. Well 12A and other drinking water production wells draw from the high permeability layers underlying the complex structure of unsaturated layers of intermediate and low permeability.

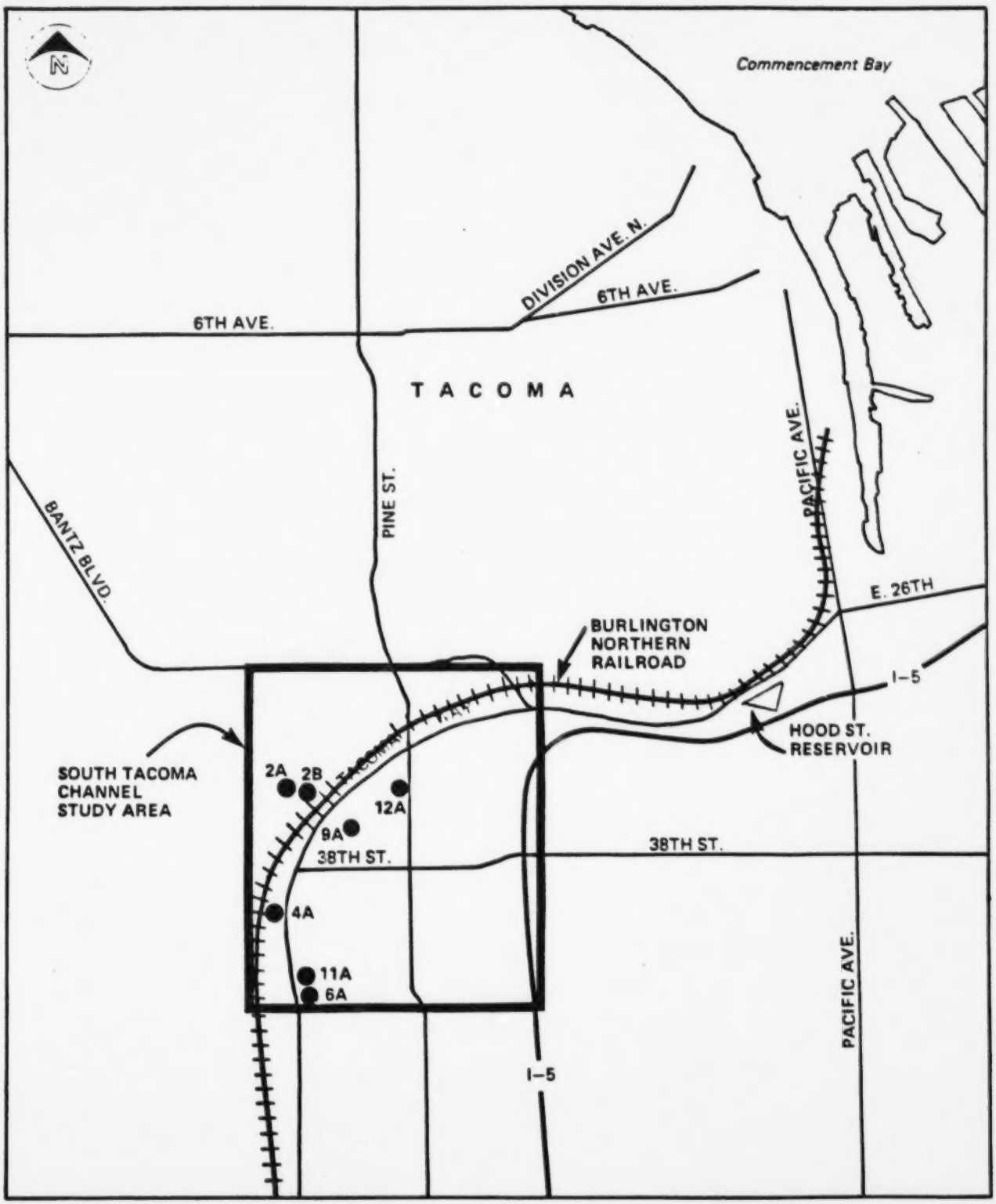
SITE HISTORY

Groundwater Contamination

In September 1981, chlorinated organic solvents were detected in Tacoma Well 12A. The well was voluntarily removed from service by the City in cooperation with the State Department of Social and Health Services. Well 12A is one of 13 wells used by the City to meet peak summer and emergency water demands. During July, August and September, the wells supply as much as 40 percent of the system demand and have a capacity of 45 mgd.

In April 1982, the United States Environmental Protection Agency authorized a remedial investigation to determine the type and extent of the contamination, to identify its migration and to locate the source(s). The contaminants at Well 12A were identified as follows:

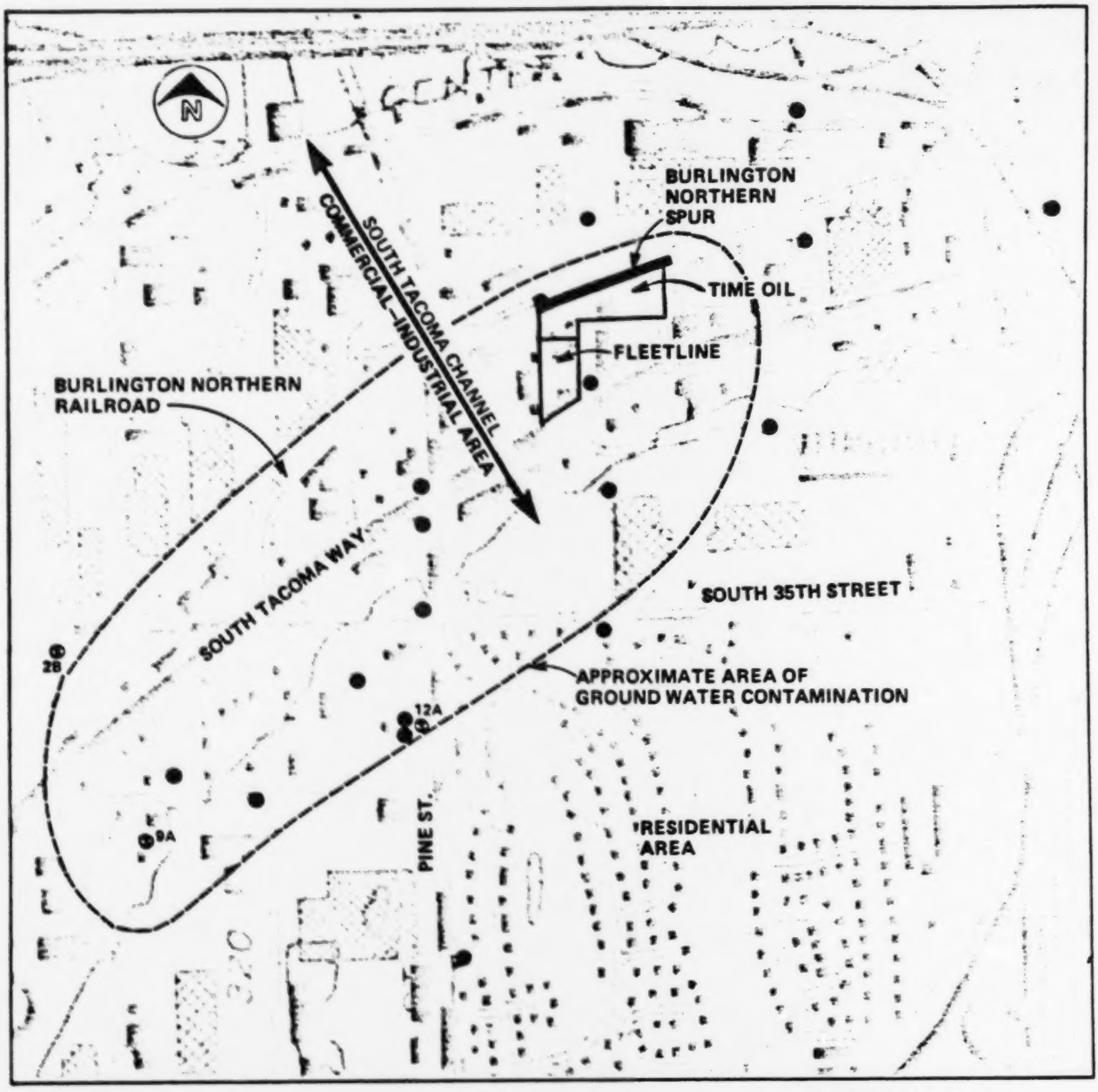
1,1,2,2-tetrachloroethane	17 to 300 ppb
1,2-transdichloroethylene	30 to 100 ppb
Trichloroethylene	54 to 130 ppb
Tetrachloroethylene	1.6 to 5.4 ppb



● City of Tacoma Wells

Scale: 1 inch = ½ mile

FIGURE 1
SOUTH TACOMA CHANNEL
VICINITY MAP



EXPLANATION

- Monitoring Wells
- City of Tacoma Wells

Scale: 1 inch = 625 feet

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FIGURE 2
MONITORING WELL AND CITY WELL LOCATIONS

South Tacoma Channel ROD

SCHEMATIC NORTH-SOUTH CROSS SECTION OF AQUIFER

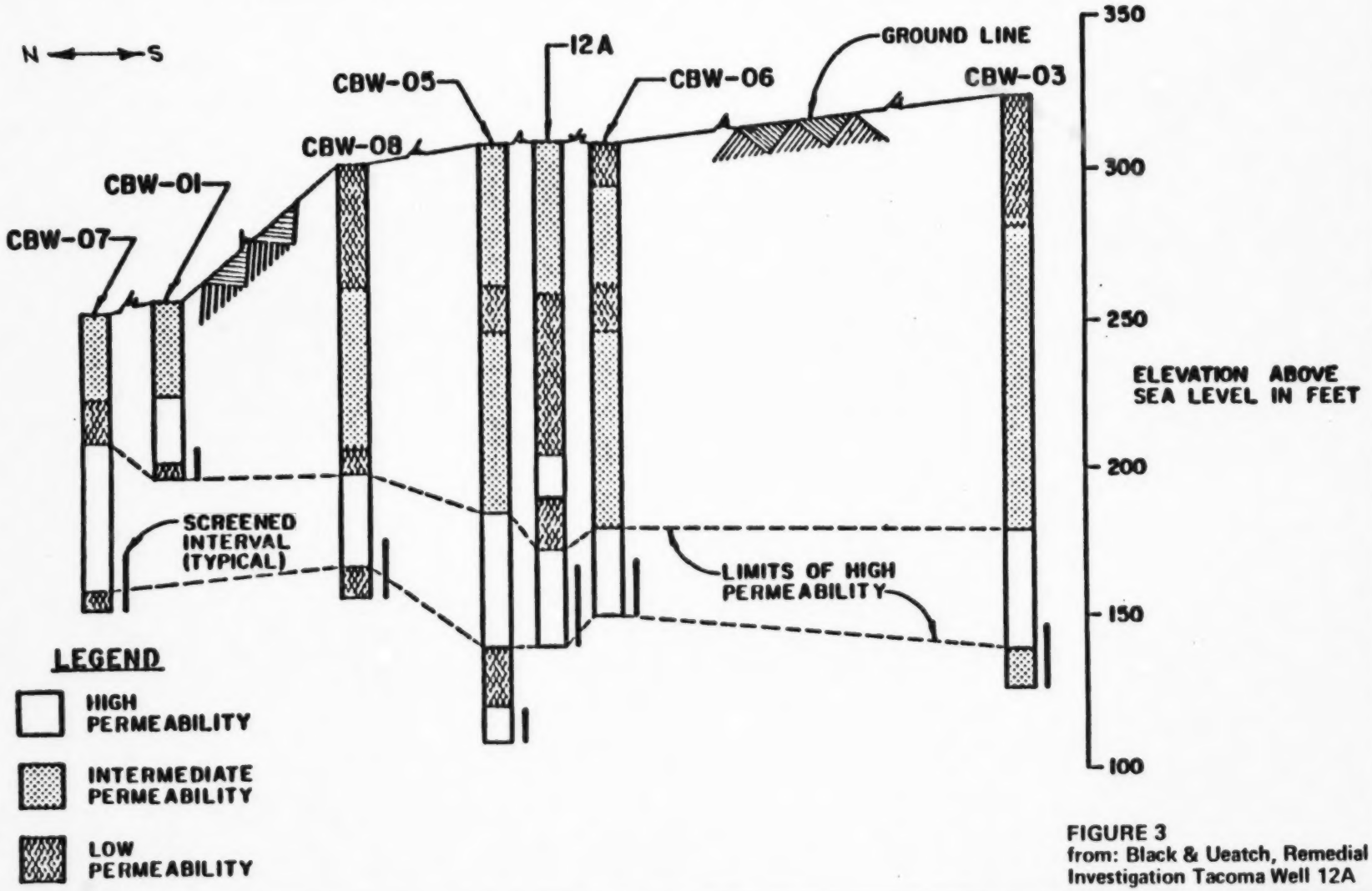

FIGURE 3
from: Black & Ueatch, Remedial Investigation Tacoma Well 12A

Remedial Investigation

During the remedial investigation, eleven monitoring wells were installed. By measuring groundwater elevation in the wells, it was determined that the natural (undisturbed by well field pumping) groundwater flow direction was from west to east with a relatively flat gradient and therefore, a low flow velocity. The study also determined that the major source of contamination was generally northeast of Well 12A. A specific source was not identified. Under these conditions, with the wellfield shut down most of the year, the contaminant plume moves slowly away from the production wells. However, under the influence of production well pumping action, the natural gradient is reversed and the contamination is drawn towards the operating wells.

One conclusion of the Remedial Investigation was that operation of Well 12A would intercept the contamination drawn from the source area even if other production wells were pumping. In effect, Well 12A would provide a barrier to the spread of contamination and protect the rest of the wellfield. If Well 12A were not operated to provide a barrier, other operating wells would draw the contaminant plume and would be lost for use.

Well 12A FFS/IRM

To avoid the potential loss of the wellfield during the approaching summer peak water demand period, EPA, in January 1983, authorized a focused feasibility study to determine a cost effective treatment system for the output of Well 12A. Treatment of the wellwater was necessary to achieve a quality that would permit discharge to Commencement Bay, or would permit its use in the City water system.

The initial remedial measure for Well 12A treatment was determined to be an air stripping system consisting of five packed towers operating in parallel at a total flow rate of 3,500 gpm and discharging treated water to either Commencement Bay or to the City's water system depending on measured quality and the City's needs. The decision level used to determine whether the treated well water would be used in the City water system or discharged to the bay was the 10^{-6} level of hazard at the tap (after dilution in the system).

Construction of this treatment system was authorized in late March 1983, and it was started up in mid-July and operated by the City until early November. Treatment performance was better than anticipated and effluent solvent concentrations did not reach the design levels. Treated water was therefore suitable for use in the City's water system during the full pumping season.

Operation of the Well 12A treatment system by the City of Tacoma will continue on a seasonal basis to protect the wellfield.

Supplemental Investigations

Because the remedial investigation completed in late 1982 identified a general source area only and not a specific site, EPA authorized in December 1982 a study of historical solvent use and disposal practices in the suspect area. Records of past investigations by the Tacoma/Pierce County Health Department, Tacoma Water Division and the State Department of Ecology were reviewed and interviews were conducted with owners of numerous businesses in the area. A follow-up study focused on the historical uses and disposal of 1,1,2,2-tetrachloroethane in the vicinity of Well 12A. These studies reduced both the number and location of potential sources of the contamination.

In mid-May 1983, EPA authorized a supplemental remedial investigation to define further the extent of groundwater contamination and to attempt to locate the source. Four monitoring wells were installed and these, as well as the previously installed monitoring wells, were sampled several times between July and November. One of the new wells (near the Time Oil, Fleetline and Burlington Northern property) showed levels of trichloroethylene, 1,1,2,2-tetrachloroethane and 1,2-trans-dichloroethylene in the low ppm range; substantially higher than detected in other wells.

With the apparent source area narrowed down substantially, EPA obtained air and near surface soil samples along the Burlington Northern railroad spur adjacent to the Time Oil plant. Air sampling results showed very low levels of contaminants, but soil samples were very high in trichloroethylene and 1,1,2,2,-tetrachloroethane.

Source History

Research into the past ownership and activities on these properties indicated that waste oil and solvent reclamation processes were used and that some of the spent filter cake was used to build the railroad spur. The use of the Time Oil site for oil recycling and related operations dates back to 1927 when William Palin began operations under the name of Palin and Son. In 1933, the business name was changed to National Oil and Paint. The two main activities of the businesses were waste oil recycling and paint and lacquer thinner manufacturing.

The waste oil recycling process consisted of collecting waste oil in a large tank, adding chemicals such as sulfuric acid, and pressurizing and heating the contents of the vessel. This process resulted in the formation of a tar-like sludge on the bottom of the tank which was removed and disposed of. Absorbents and clay materials were also added to the oil. The sludge was filtered from the oil, and the resulting filter cake was disposed of or stored in various piles on the site. Some of this sludge was also used for fill around the site.

The paint and lacquer thinner manufacturing involved the use of many solvents that were stored on the site in barrels which may have leaked their contents into the soil.

Prior to purchase of the property by Time Oil, Inc., in 1964, the remaining barrels and drums of solvent were removed from the site. After Time Oil purchased the property, operations continued under the name National Oil and Paint until 1972. During this period, National Oil was involved only in waste oil recycling. Waste sludges and filter cakes were not known to be stored on the site during this period.

In 1972, Time Oil leased the facilities to Golden Penn, Inc. Golden Penn operated on the site until 1976, before going out of business as a result of a destructive fire. In 1975 and 1976, Golden Penn was ordered by the State of Washington to clean up the site by removing some of the filter cake and spilled oil from the ground.

In 1976, Time Oil resumed operation at the site. Since then their operation has been limited to canning oil brought to the site in bulk containers. In 1982, the Burlington Northern Railroad spur was extended by Time Oil to its present length so that oil could be delivered by tanker car. During the construction of the spur, some of the filter cake or sludge material stored on the site was used in the roadbed.

CURRENT SITE STATUS

During the remedial investigation, the extent of soil and groundwater contamination near the Time Oil plant was explored by means of surface soil samples, shallow and deep soil borings and monitoring wells. Figure 4 shows the locations of these sampling points.

Groundwater surface contours and elevations are shown on Figure 5 for the condition where Well 12A and the rest of the wellfield had been shut down for a long period of time. The flat gradient resulting in low water velocities is indicated by the wide spacing between contour lines. The natural flow, in the absence of wellfield pumping, is from Well 12A toward the Time Oil site.

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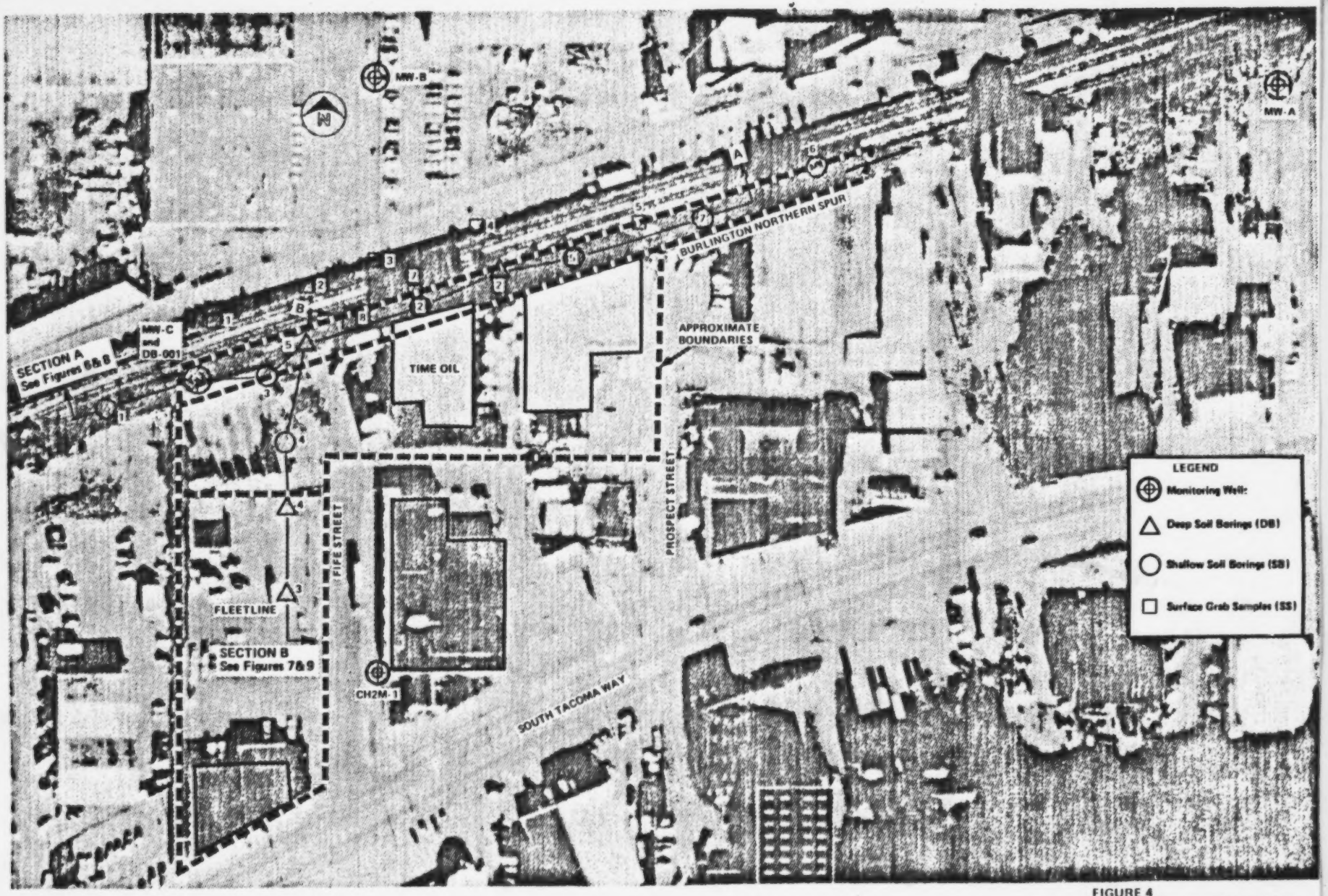

FIGURE 4
SOUTH TACOMA CHANNEL SITE
South Tacoma Channel ROD

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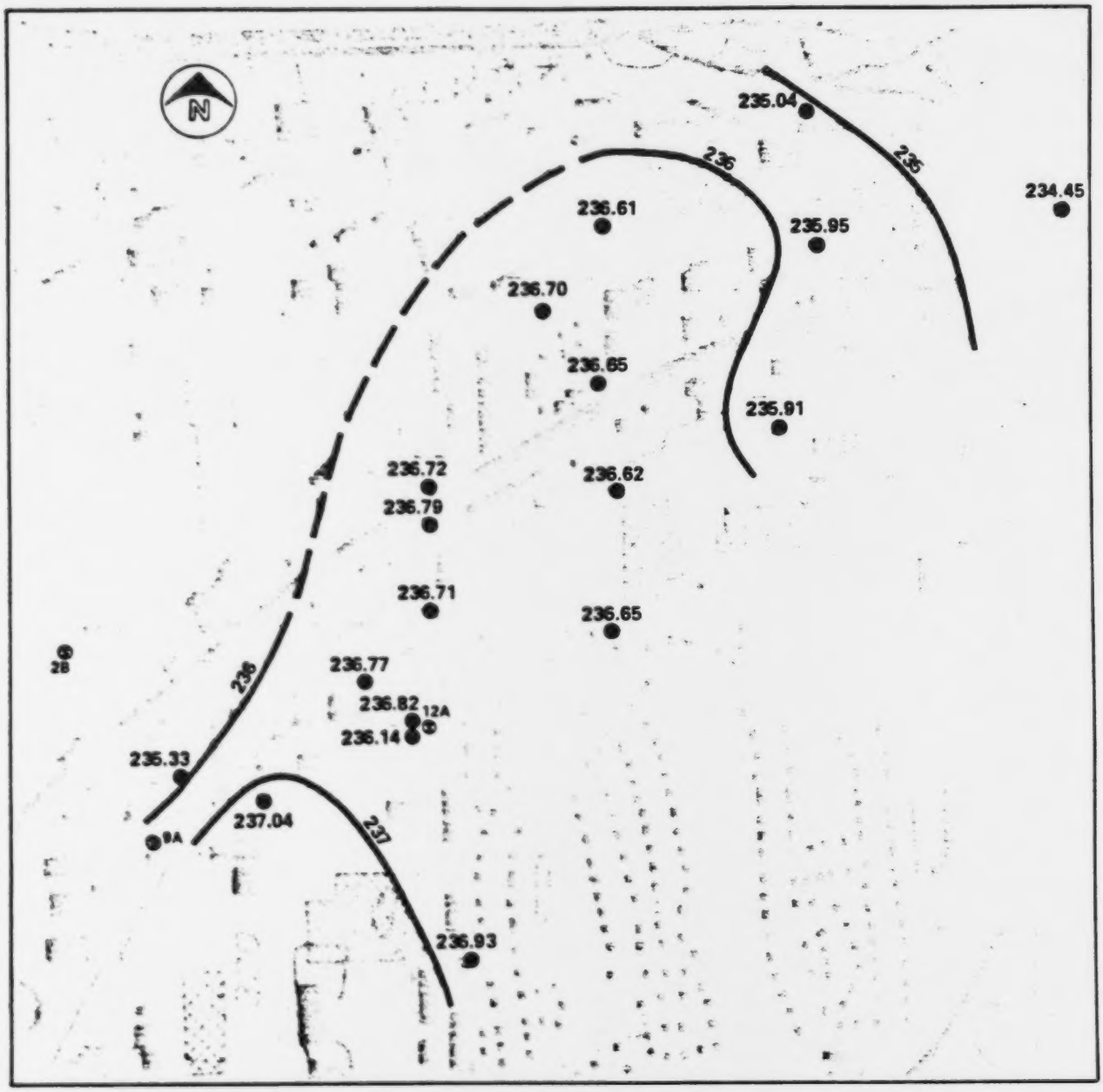


EXPLANATION

235.33 — Elevation of static water level in feet above City of Tacoma datum.

236 — Contour representing points of equal elevation of water table surface. Dashed where inferred.

Scale: 1 inch = 625 feet

FIGURE 5
WATER TABLE CONTOURS FOR 4/4/84 DATA

South Tacoma Channel ROD

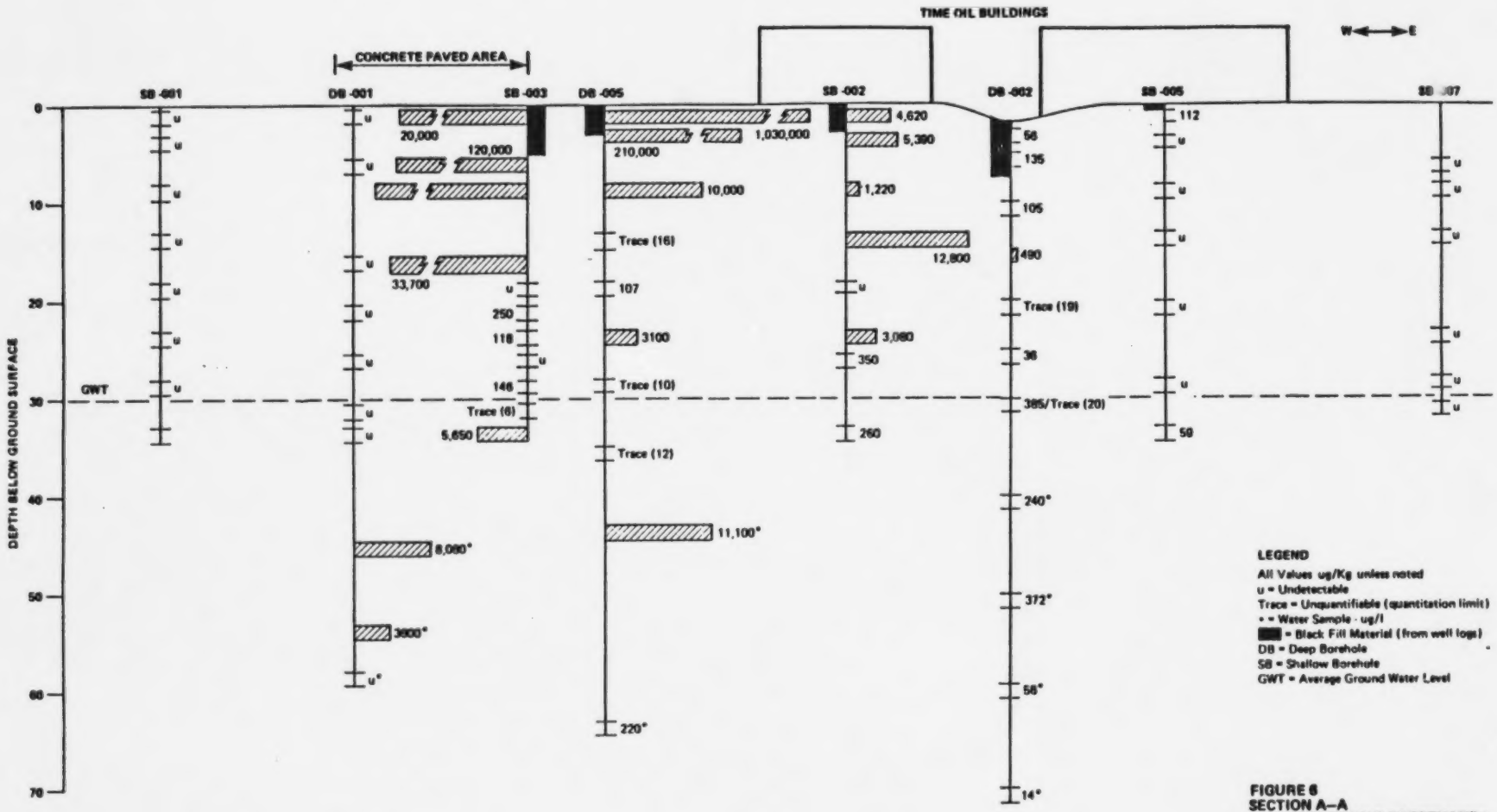


FIGURE 6
SECTION A–A
1, 1, 2, 2 TETRACHLOROETHANE + TETRACHLOROETHYLENE
February 1984

South Tacoma Channel ROD

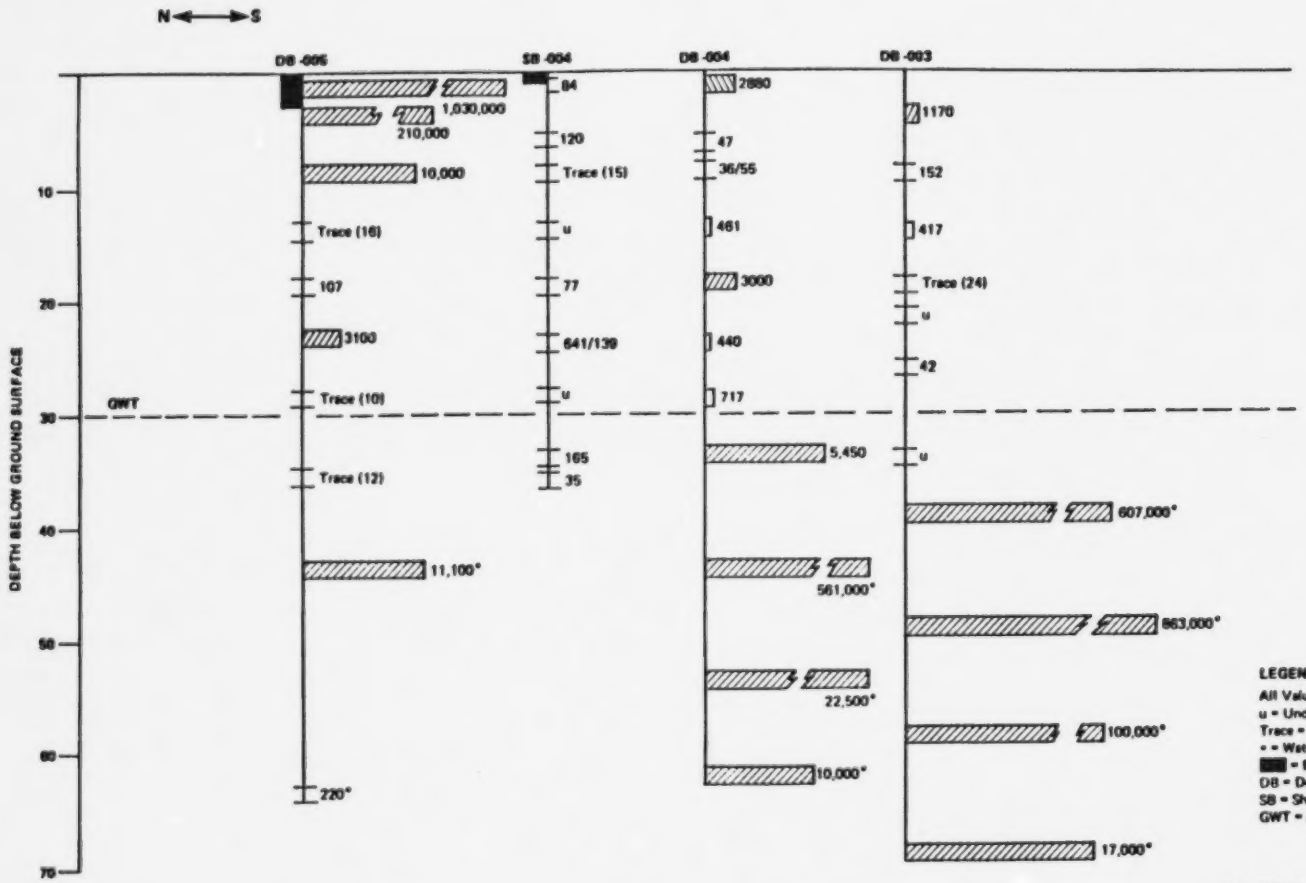


FIGURE 7
SECTION B–B
1, 1, 2, 2 TETRACHLOROETHANE + TETRACHLOROETHYLENE
February 1984

South Tacoma Channel ROD

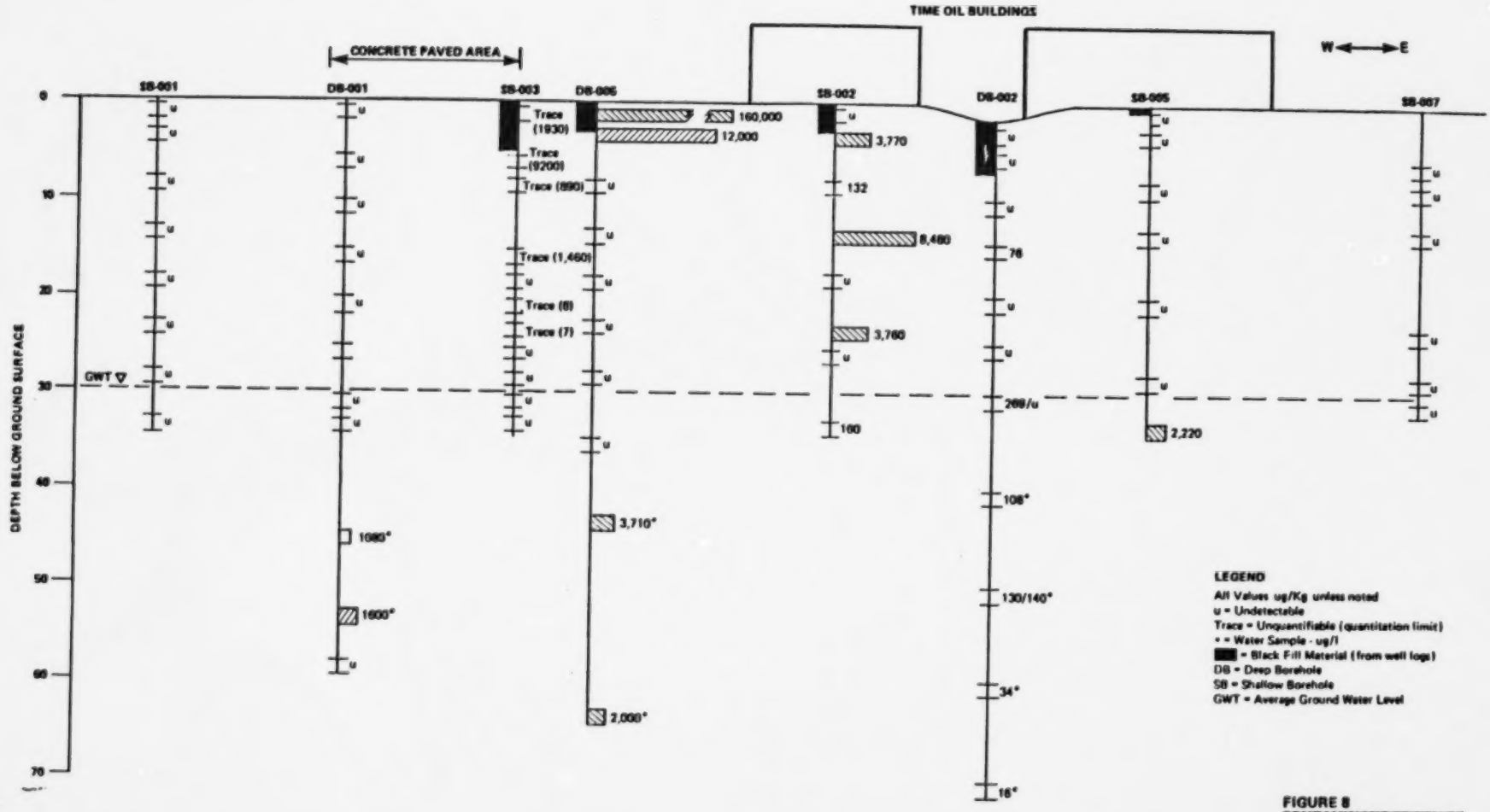


FIGURE 8
CONTAMINANT PROFILES
SECTION A–A
TRICHLOROETHYLENE
February 1984

South Tacoma Channel ROD

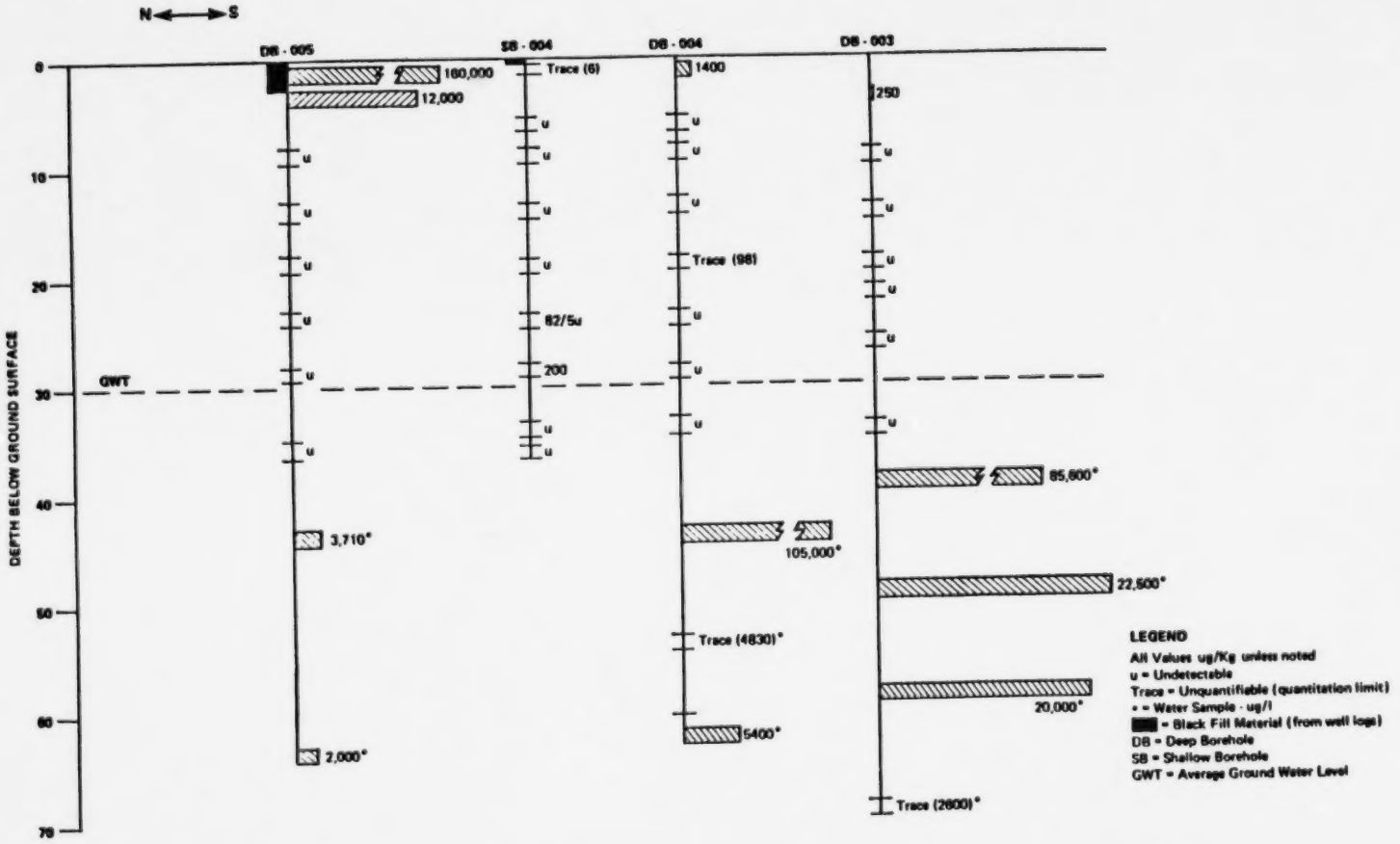


FIGURE 9
CONTAMINATION PROFILES
SECTION B–B
TRICHLOROETHYLENE
February 1984

South Tacoma Channel ROD

Chemical data for 1,1,2,2-tetrachloroethane and tetrachloroethylene taken from soil borings along the spur (Section A-A on Figure 4) and along a North-South line (Section B-B on Figure 4) are shown in Figures 6 and 7. Data for trichloroethylene is displayed in Figures 8 and 9. These compounds are the ones of primary interest because they are the contaminants at Well 12A. Many others, not found at Well 12A, were also detected at much lower concentrations.

Along the east-west line of borings, high values of soil contamination are located along the spur adjacent to the western Time Oil building and continuing for a distance of at least 150 feet west of that building. Measured concentrations of the contaminants is greater than 3,000 parts per billion (ppb) of soil to depths of about 25 feet. Highest concentrations were found near the surface at levels up to about 1000 parts per million (ppm) of soil.

Along the north-south soil boring line, soil contamination concentrations to about 3,000 ppb of soil were measured to a depth of about 20 feet on the north end of the Fleetline property.

Continuity between this near surface soil contamination and that in the aquifer was established. The total quantity of solvents contained in the soil from the ground surface to the groundwater level was grossly estimated at about 1500 lbs.

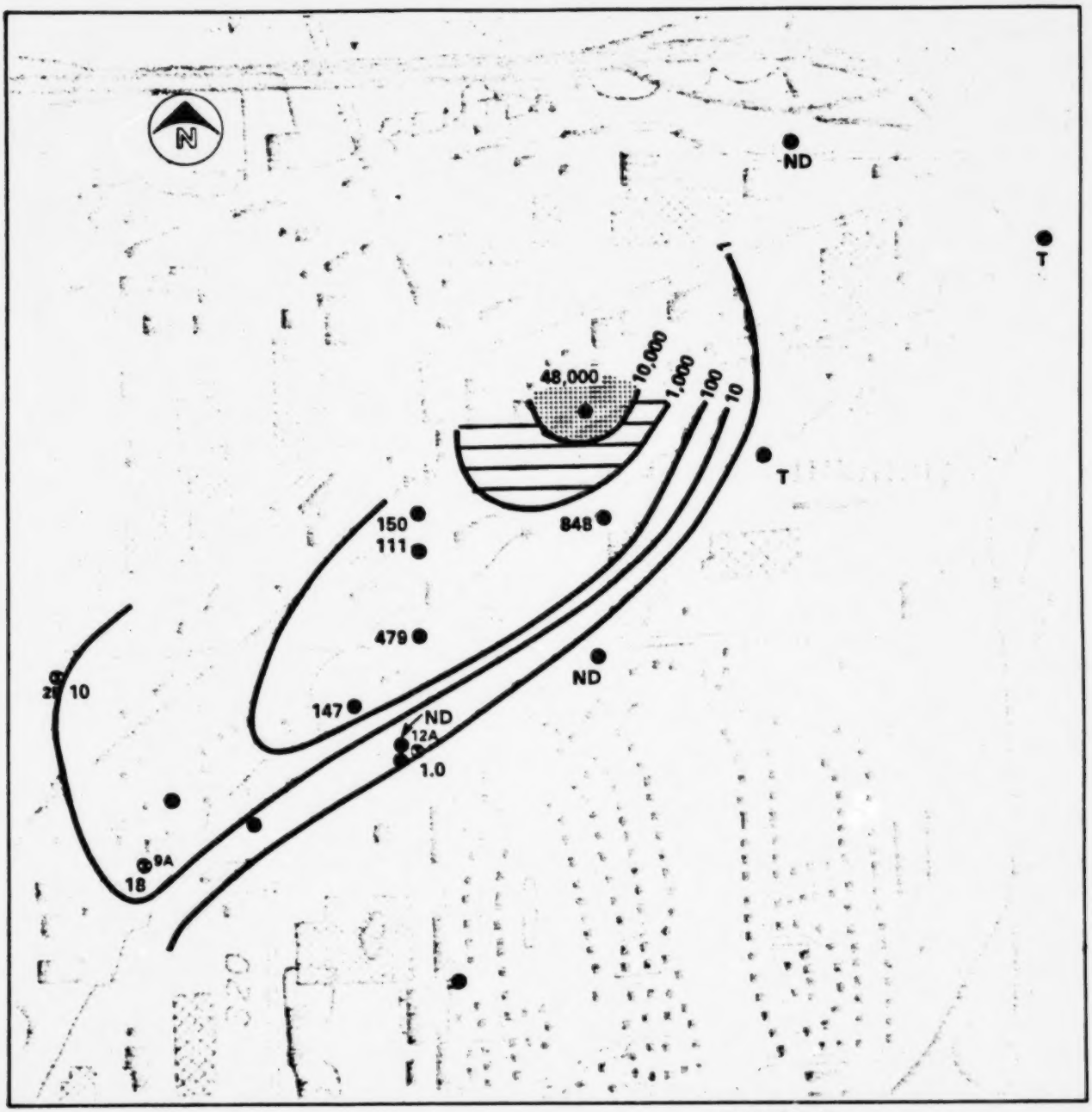
Groundwater contamination was found along the east-west line of borings in the same boreholes as the major soil contamination. Levels ranged up to about 11,000 ppb of water. Along the north-south line of borings, levels up to 863,000 ppb were measured under the Fleetline property. This southward displacement of the highest aquifer contamination is likely to have resulted from the previous pumping action of the wellfield.

Groundwater Contamination Migration

During Wellfield Pumping

Prior to startup of the Well 12A treatment system in July 1983, Well 12A had been shutdown since mid 1981, except for brief periods of operation for water sampling. However, other wells in the wellfield had been being operated on demand.

Figure 10 shows the approximate contours of 1,1,2,2-tetrachloroethane that existed at the time of startup of the treatment system. The highest concentrations existed near the Time Oil site with decreasing concentrations toward the wellfield. The translation of the plume toward operating wells (9A & 2B) can be seen on this diagram. After pumping



ND = Non-detectable

T = Trace

Scale: 1 inch = 625 feet

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FIGURE 10
CONTAMINATION PLUME
1, 1, 2, 2 TETRACHLOROETHANE
(Concentrations ppb)
July 14 to 27, 1983
Before 12A Startup

began at Well 12A, the contamination levels increased at Well 12A and decreased at the other production wells as the plume was preferentially drawn to Well 12A. (See Figure 11.) At the end of the pumping season in early November, the 1,1,2,2-tetrachloroethane concentration at Well 12A was about 45 ppb, a decrease from the mid August level of about 60 ppb. Following shutdown of the 12A treatment system in November, the plume contours returned more nearly to their original locations, and the concentration at Well 12A was reduced to about 5 ppb.

During the summer of 1983, the treated water from Well 12A was suitable both for use in the City's water system or for discharge to the bay throughout the pumping season. Observations of the plume migration under wellfield pumping conditions indicate that effluent from the Well 12A treatment system should be suitable for discharge to the bay during future pumping seasons. Furthermore, operation of Well 12A should continue to block the spread of contaminants into the remainder of the wellfield during future pumping seasons. Based on the observed performance of the treatment system, the level of 1,1,2,2-tetrachloroethane would have to average about 1000 ppb over a pumping season before the present bay discharge limit would be reached. Observations on plume migration during the second (1984) pumping season further substantiate the above conclusions.

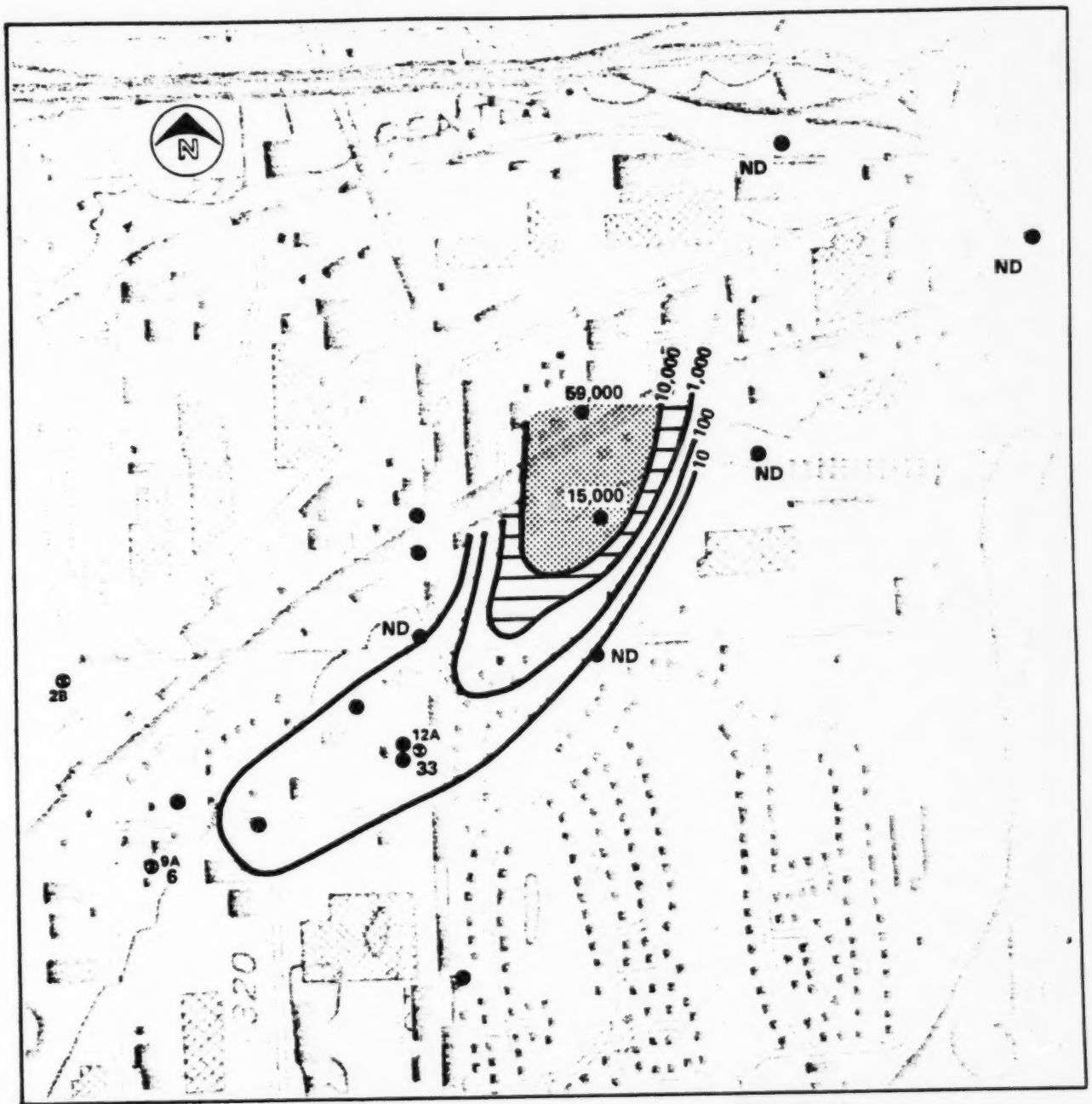
Endangerment Assessment

Public health may be threatened either by direct contact at the source area or by consumption of contaminated drinking water if no additional remedial action is taken.

Table 1 identifies the concentrations of the major contaminants at the source and in the well water as measured during the remedial investigation. All are known to be toxic and/or suspected carcinogens.

Direct contact, inhalation and/or ingestion of the contaminants at the source area is one of the pathways of major concern. The railroad spur and mainline areas are open to free access by the public. Factory workers cross the tracks and Time Oil property regularly, and railroad workers must maintain the tracks and roadbed. Although little data are available on chronic dermal exposure to these chemicals, an assessment was made of possible effects for a range of exposures to the contaminated soil assuming 25 hours a year at 10 percent absorption to 480 hours a year at 50 percent absorption. Results, presented in Table 2, indicate a cancer risk at the 10^{-3} to the 10^{-6} level of hazard.

Consumption of contaminated wellwater is the second pathway of exposure. Well 12A and the other wells in this system supply up to 40 percent of the City of Tacoma's peak summer demand. Approximately 214,000 people are served by City water.



ND = Non-detectable

Scale: 1 inch = 625 feet

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FIGURE 11
CONTAMINATION PLUME
1, 1, 2, 2 TETRACHLOROETHANE
(Concentrations ppb)
September 21, 1983
~ 1½ Months After 12A Startup

In order to assess the risk to public health from drinking contaminated water the following assumptions were made: the well field would be used for 90 days a year, the output of Well 12A would not be treated, the contamination levels observed during the 1983 pumping season would be repeated, the Well 12A output would be thoroughly mixed with uncontaminated water in the Hood Street Reservoir, a short term dose of carcinogens can be averaged over the entire year, and the lifetime cancer risk is the sum of risks associated with each chemical. Results are shown in Table 3 and indicate that the cancer risk under these conditions would be at the 10^{-5} to the 10^{-6} level of hazard. Actual normal use of Well 12A exceeds three months a year however, and is expected to cause the contaminant concentration to increase at Well 12A and approach those levels shown in Table 3 as the higher contaminant concentrations in the aquifer are drawn in from the source area. Using the assumptions for dillution in the city water system from above, this would produce a risk level of approximately 10^{-4}.

TABLE 1

MAJOR VOLATILE ORGANICS IN SOUTH TACOMA STUDY AREA

Constituent	Location	
	Railroad Spur Fill (ug/kg)	Well 12Aa (ppb)
1,1,2,2-tetrachloroethane	1,030,000b	61
Tetrachloroethylene	1,030,000b	1.6
Trichloroethylene	160,000	79
1,2-(Trans)dichloroethylene	3,920	30
Chloroform		0.1

a City of Tacoma data.

b Could not be differentiated.

Table 2

COMPARISON OF DERMAL CONTACT AND INGESTED CONCENTRATIONS AT THE RAILROAD SPUR WITH RISK CRITERIA

	Maximum Concentration (mg/kg wet soil)[a]	Contact Chemical Intake (mg/year) For Soil Contact Factor		Ingested Chemical (mg/year)		Total Intake (mg/year)		Equivalent Water Concentration (ppb)[b]		Concentration Multiplier[c]		Increased Cancer Risk ($\times 10^{-6}$)[d]	
		10^{-6}	10^{-1}										
Trichloroethylene	160	0.02	20	0.05	1	0.07	20	0.1	30			0.04	11
Tetrachloroethylene 1,1,2,2-tetrachloroethane	1,030	0.1	100	0.3	6	0.4	100	0.6	100			3	900
1,2-(trans)dichloroethylene	3.9	.0004	0.4	0.001	0.02	0.0002	0.4	0.002	0.6	6×10^{-6}	2×10^{-3}		
1,1,2-trichloroethane 1,3-(cis)dichloropropene Chlorobromobenzene	3.2	0.0003	0.3	0.001	0.02	0.001	0.3	0.002	0.4			0.003	0.7
1,1,1-trichloroethane 2-chloroethylvinyl ether	0.5	0.00005	0.05	0.0002	0.003	0.0002	0.05	0.0003	0.07				
Chlorobenzene	0.5	0.00005	0.05	0.0002	0.003	0.0002	0.05	0.0003	0.07				
Total												3	900

[a] Highest concentration measured within 0.5 foot of surface.

[b] Two l/day, 365 days/year.

[c] Equivalent water concentration divided by 10-day criterion.

Table 3
COMPARISON OF WELL 12A CHEMICAL
CONCENTRATIONS TO RISK CRITERIA

	Well Water Concentrations (ppb)[a]			Concentration Multiplier[b]		Increased Lifetime Cancer Risk ($\times 10^{-6}$)		
	Min[a]	Max[a]	Potential Future	Min	Max	Min	Max	Potential Future
Trichloroethylene	26	79	1,200			0.4	1	20
Tetrachloroethylene	0.4	1.6				0.02	0.08	
1,2-(trans)dichloroethylene	6.2	30		0.001	0.005			
1,1,2,2,-tetrachloroethane	21	61	1,000			5	10	200
Total						5	20	300

	Concentration out of Stripping Tower (ppb)			Increased Lifetime Cancer Risk ($\times 10^{-6}$)		
	Min	Max	Potential Future	Min	Max	Potential Future
1,1,2,2,-tetrachloroethane	1.0	3.0	100	0.2	0.7	20
Tetrachloroethylene	0.1	0.3		0.005	0.02	
Trichloroethylene	ND	ND	ND			

[a] From pump test on August 4, 1983, through October 31, 1983.
[b] Well level divided by 10-day criterion.

Columns do not sum because of rounding off adjustments.

ND--not detectable.

ENFORCEMENT and NEGOTIATIONS

Four firms have been identified as potentially responsible parties (PRPs): Time Oil Company; Burlington Northern Railroad; Fleetline Automotive; and B & W Investment (the owner of the Fleetline property). Contaminated soil has been found on property occupied by Time Oil, Burlington, and Fleetline. All four companies have been sent CERCLA notice letters, and information requests under section 104(e) were sent to Time Oil and Burlington.

Negotiations were conducted with the potentially responsible parties during the Fall of 1984. Discussions centered around the technical scope of the proposed remedial as well as the adequacy of the RI/FS. The negotiations were unsuccessful in concluding a consent order with the potentially responsible parties undertaking the remedial action. Additional discussion regarding the comments of the PRP's is available in the Responsiveness Summary.

ALTERNATIVES EVALUATION

Objectives

The objectives of the proposed remedial action are the mitigation and control of contamination in the groundwater and in the soil at the source area. The requirements of CERCLA section 104, EPA's mandate to protect the public health and welfare and the environment, determine the goals and level of response for the site.

Alternative Screening Process

Conceptual alternatives presented in the RI/FS are listed on Table 4. These conceptual alternatives were screened in a sequential process starting with an evaluation of each alternative with regard to technical feasibility. Alternatives surviving this screening were then evaluated with respect to environmental effects. Comparative costs were then developed and used to screen conceptual alternatives to exclude from further evaluation those with substantially greater costs than other alternatives where they did not provide significantly greater levels of protection.

Table 4
CONCEPTUAL ALTERNATIVES

Alternative	Response	Objective
	Tap Water Protection	Surface Contamination Mitigation
1. Fence and sign site		X
2. a. Cap railroad spur b. Cap the exposed Time Oil and Fleetline soils		X
3. a. Replace spur roadbed (to 5ft ±) b. Replace exposed Time Oil and Fleetline soils	X	X
4. Soil replacement below spur, Time Oil and Fleetline property (to 20'± depth)	X	X
5. Deep excavation and containment or replacement of the spur, Time Oil, and Fleetline property (to 30ft ± depth)	X	X
6. Slurry wall around site down to impervious strata below aquifer	X	
7. Groundwater extraction well at source with treatment before discharge.	X	
a Treatment at source b Treatment at 12A off peak 1 Treatment to potable water quality 2 Treatment to waste discharge criteria 3 Treatment to recharge quality criteria		
8. Intermediate location collection wells with treatment before discharge	X	
a Treatment at source b Treatment at 12A off peak 1 Treatment to potable water quality 2 Treatment to waste discharge criteria 3 Treatment to recharge quality criteria		
9. Continue 12A treatment system	X	
10. In situ biological source treatment		X

Detailed Analyses

The remaining alternatives were subjected to more detailed analyses consisting of:

- Refinement of engineering detail such as volume of soils to be handled, excavation and shoring techniques, hauling distances, extraction/injection well component sizing, and modifications to the Well 12A facilities for long-term operation.

- Cost estimates based on the limited level of detail contained in the above engineering descriptions. Estimates considered construction factors such as anticipated health and safety concerns, excavation, shoring, and heavy equipment use in a constrained work area. Annual operations, maintenance and replacement costs were also estimated where appropriate. Estimates were prepared for comparative purposes and not for budget planning. Present worth calculations were made and the total estimated present worth comparative cost for each alternative was presented. A range of costs varying from +50 percent to -30 percent of the calculated estimate was used for cost comparisons reflecting the expected accuracy of these estimates at this level of engineering detail.

- The development of engineering detail included considerations of implementation, adverse environmental concerns, and constructability. These were reflected in the cost estimates. Known institutional requirements were identified separately.

- An overall evaluation of each alternative to mitigate or correct a particular contaminant problem and a comparison between alternatives addressing the same problem.

- Identification of combinations of alternatives that in total were options for the full scope of required remedial action.

- A recommendation for adoption of an option which will most reliably meet the site objectives at the estimated least cost.

The following is a discussion of the various alternatives under consideration. The alternatives and their costs and their technical, environmental and public health considerations are summarized in Table 5. For purposes of this discussion, the Fleetline and Time Oil properties including the Burlington Northern Railroad spur will be referred to as the source area. The source area is approximately 2000 feet northeast of Well 12A. The remedial alternatives described below can be placed into two general categories: (1) treatment of the contaminant plume in the portion of the aquifer underlying the source area; and (2), treatment of the contaminated soils in the unsaturated zone at the source area.

TABLE 5

Alternatives Matrix

Alternative	Cost x $1000 Capital	Present Worth O & M	Public Health Considerations	Environmental Considerations	Technical Considerations	Public Comment	Other Comments
No Action (Continue IRM)	-0-	860	Blocks contaminant migration into wellfield. Does not address direct contact hazard	Concedes long term contamination of groundwater, soils	IRM Proven effective in controlling contaminant movement	not acceptable by itself	IRM will continue and will be part of alternative selected institutional requirements
Near Source GW Extraction Aeration treatment			Does not address direct contact hazard	provides some washing of contaminated soil	reliable, proven technology		creates acceptable air emission, institutional controls
A. Treat to level allowing direct discharge of Well 12A and/or treatment of Well 12A to 10^{-6} standard	540	534	Can provide DW to 10^{-6} Standard at the tap	Concedes long term GW contamination at reduced level		acceptable as component of final RA	long term use of IRM.
B. Treat to level allowing use of Well 12A without treatment factoring in dillution in DW system	540	592	can provide DW at 10^{-6} standard at the tap	concedes long term GW contamination at reduced level		acceptable as component of final RA	operation of DW system to provide dillution (24x)
C. Treat to level allowing use of Well 12A without treatment	540	951	provides 10^{-6} DW throughout DW system	Reduces GW contamination to 10^{-6} level within wellfield		acceptable as component of final RA	long term operation of extraction well.
D. Treat GW to 10^{-6} DW standards at hazardous waste site boundaries	540	1230	provides 10^{-6} DW throughout aquifer	reduces GW contamination throughout aquifer		reluctance by agencies providing O&M	Long term operation of extraction well

TABLE 5 (continued)

Alternative	Cost x $1000 Capital	Present Worth O & M	Public Health Considerations	Environmental Considerations	Technical Considerations	Public Comment	Other Comments
Cap portions of Time Oil	50		Eliminate direct contact		simple technology	acceptable	
SPUR Removal, soil excavation, off site disposal			"	Removes and secures contaminated material	simple construction technology	acceptable	transfers contaminants to secure location
Excavation							
A. To Five Feet	1,000	-0-	"	Removes most highly contaminated material	removes soil which would resist treatment	acceptable	
B. To Twenty Feet	2,500	-0-	"	Removes more contamination than shallow excavation	can be accomplished but requires extensive shoring fill.	acceptable	
C. To GW Table Removal of all contaminated soil within boundaries on site disposal in lined excavation	14,500	1,500	"	isolates all contaminants from soil	difficult excavations, demolition		on site disposal lower cost than removal

No Action Alternative

The No Action alternative would involve no further action by EPA. The IRM previously implemented would be continued in order to provide the treatment to the Well 12A effluent to allow its use in the drinking water system or discharge to Commencement Bay. The cost of the O&M for the treatment of Well 12A would be the responsibility of the State of Washington. This alternative does nothing to mitigate soil contamination and little to mitigate groundwater contamination, but operation of Well 12A is necessary to prevent the further spread of the contaminant plume into the municipal wellfield. Very long term operation of Well 12A (in excess of 100 years) may eventually flush the aquifer and the contaminant plume at the source to the point where the untreated effluent from Well 12A, when mixed and diluted in the City water system, could provide the 10^{-6} level of hazard at the tap. However, it is likely that as the heavily contaminated plume is drawn towards Well 12A, the levels of contamination at the well would exceed the capacity of the present treatment system. This would result in the inability to use the treated groundwater in the city drinking water system unless the treatment system is upgraded.

The No Action alternative does not alleviate the possibility of direct exposure at the source area. The public would still be able to make direct contact with, ingest, or inhale dust or vapors from the contaminated soils at the railroad spur and other locations on the Time Oil property. Further, the No Action alternative would leave open the possibility that users of the city water system would be exposed to water at the 10^{-4} risk level as the higher levels of contamination now in the source area are drawn towards Well 12A and the wellfield.

Groundwater Treatment at the Source

The proposed treatment of the groundwater at the source would be in conjunction with the continued operation of the 12A treatment system (the IRM). The contaminated groundwater would be drawn from the aquifer through extraction wells located at the source, treated by a single pass through an air stripping tower, possibly followed by carbon adsorption, and discharged to surface waters. A portion of the treated water would be directed to a drainfield consisting of perforated pipe set at a shallow depth. The purpose of the drainfield would be to flush or leach contaminants remaining in the soil matrix (below the excavated zone) to the groundwater where they would be collected. The system would be operated until the accepted level of treatment is reached. Extraction and treatment of groundwater at the source should offer significant reductions in the treatment duration that would be required if the groundwater were treated at Well 12A only, as described in the No Action Alternative.

Reinjection of the treated water was discussed in the RI/FS but has been set aside in lieu of surface discharge. The costs are equivalent. Surface discharge should, however, allow for a more rapid treatment of the contaminated aquifer.

Aeration treatment of the extracted groundwater will result in the emission of volatile organic solvents from the system. The estimated amount, based upon the groundwater concentration and removal efficiency, is 200 pounds per day for the initial weeks of operation. The amount would steadily decrease as treatment of the aquifer is achieved. By comparison, the Well 12A IRM releases less than 40 pounds per day. Under the worst case conditions, the concentrations of solvents occurring a short distance downwind from the source extraction system would be less than one percent of the allowable concentration set by OSHA for an 8 hour occupational workplace exposure.

As presented in the RI/FS, the principal contaminants found in the aquifer are: trichloroethylene, tetrachloroethylene, 1,2-(trans) dichloroethylene and 1,1,2,2- tetrachloroethane. Of these, based on water quality criteria for human consumption of drinking water, 1,1,2,2-tetrachloroethane provides the greatest risk as a carcinogen for any given level of exposure. Furthermore, 1,1,2,2-tetrachloroethane is the most resistant to treatment by air stripping. Therefore the design of any treatment system would be based upon 1,1,2,2- tetrachloroethane.

For purposes of assessment of the probable cost of groundwater treatment, several approaches for determining the extent of groundwater treatment were evaluated. In this assessment, the 10^{-6} risk level was used to represent the level of exposure which would provide adequate protection, and the alternatives differed based upon the degree to which long term protection would be provided by treatment of the plume at the source, as opposed to reliance upon other methods, such as institutional controls upon groundwater use. The alternatives assessed are nested in such a way that when the selected level of treatment is achieved, the lesser levels of treatment are also achieved in the interim. Thus when the groundwater extraction system is operated, it will proceed sequentially through the various levels, in effect shrinking the areal extent of the contaminant plume. The alternatives are presented for purposes of discussion of the range of costs and treatment levels available.

A. Treat the groundwater and establish a level such that the effluent from Well 12A could be discharged untreated to the bay or with treatment, the 12A effluent could be utilized in the City water supply after dilution with other waters. This option is the least rigorous and is similar to the preferred option in the RI/FS.

An institutional control in the form of deed restrictions would be necessary to prevent installation of any wells between the source and Well 12A. The concentration of 1,1,2,2-tetrachloroethane would be approximately 20 ppb in the Well 12A effluent . It is estimated that with a 200 gpm extraction rate at the source, a 20 ppb level could be achieved at 12A in approximately one year.

B. Treat the groundwater and establish a level such that the untreated effluent from Well 12A could be used (after 24:1 dilution in the City system) as drinking water. This option would provide 10^{-6} level of hazard at the tap. Institutional control similar to (A) is required. The concentration beneath the source would be approximately 2000 ppb and about 2 ppb at Well 12A. These levels might be achieved in one to two years if 200 gpm is extracted at the source.

C. Treat the groundwater and establish a level such that the Well 12A effluent would be at the 10^{-6} level of hazard, with no dilution. Institutional control is required. At the source, the 1,1,2,2 concentration would be approximately 85 ppb and at Well 12A, the concentration would be 0.1 ppb. The estimated treatment duration is 2 to 10 years at 200 gpm.

D. Treat to a level such that the groundwater at the source (within the property boundary) is at the 10^{-6} level of hazard. This option provides the greatest environmental protection in the sense that no portion of the aquifer (outside of the property boundary) is written off. A temporary (probably 20+ years) institutional control would be required between the source area and Well 12A until the plume outside the source area is treated to the 10^{-6} level of hazard. Treatment to this level could take anywhere from 30 to 200 plus years at 200 gpm.

The alternatives just presented all use the same treatment technology but vary in the duration of treatment (and hence, the cost of treatment). Alternatives A, B and C all require permanent institutional control of groundwater use. Alternative D would require an institutional control during the many years it will take before the plume outside of the source area is treated. The controls would prevent the use of contaminated water, protecting public health, and would assure that any extractions or injections into the groundwater would not interfere with the remedial treatment system. Institutional controls could be accomplished by the State of Washington through the control of water rights.

Table 6
Groundwater Extraction/Treatment Costs
K $

200 gpm	Capital	O & M Low	O & M High	(Salvage)/ Replacement		Total Cost Low	Total Cost High
A	540	65		(71)		534	
B	540	65 (1 yr)	118 (2 yr)	(71)	(66)	534	592
C	540	118 (2 yr)	436 (10 yr)	(66)	(25)	592	951
D	540	613 (30 yr)	650 (200+ yr)	24	48	1,177	1,238
400 gpm							
A	620	74		(82)		612	
B	620	74	74	(82)	(82)	612	612
C	620	74 (1 yr)	295 (5 yr)	(82)	(59)	612	856
D	620	633 (15 yr)	925 (200+ yr)		28	1,253	1,173

All Costs Present Worth

The costs for the various alternatives are presented on Table 6. Present worth costs for the 200 gpm system range from $605,000 for alternative A to $1,190,000 for alternative D. Treatment durations and costs are also provided for a 400 gpm system for purposes of comparison. The high and low cost ranges are dependent upon assumptions of soil characteristics. A system with larger extraction capacity would accelerate groundwater treatment with an increase in capital and O & M cost. System size can be optimized during preliminary design.

Treatment and Disposal of Contaminated Soil

In the RI/FS, two areas of contaminated soil were identified; the soil under the railroad spur and soils elsewhere on the Time Oil and Fleetline properties. The principal soil contamination occurs in the uppermost soils under and adjacent to the railroad spur. Here, the contaminant concentrations generally decrease with depth. In the soils underlying the other properties, low levels (hundreds of ppb) are found throughout the soil column.

One purpose of treating or disposing of the contaminated soils is to eliminate the possibility of direct public exposure to the soils. A second purpose is to eliminate the possibility of long term leaching of contaminants into the groundwater. Quantitative analysis of the effects of long term leaching on the duration of groundwater treatment has not yet been conducted. However, the length of treatment of the aquifer would clearly depend on the degree to which the overlying soils continue to leach contamination to the groundwater. Limited soil excavation can remove most of the estimated solvent contamination in the soil and reduce the solvent available to the aquifer.

Three approaches were evaluated for the purpose of eliminating the risk of public exposure to the soils and reducing the potential for further contamination of the aquifer. The first is excavation and removal to either a RCRA landfill or a secured location on site. The second is treatment by flushing until contaminant concentrations in the soil and underlying groundwater reach a yet to be established level consistent with the situation surrounding the site. Third, the contaminated soil could be capped and surrounded by monitoring wells in a manner consistent with RCRA site closure procedures.

Specific alternatives considered include leaving contaminated soils in place and capping, excavation and disposal off-site of the uppermost 5 feet, excavation and disposal of the uppermost 20 feet of soils, and excavation to the water table (a depth of 30 feet) with on-site disposal in a lined facility. Present worth costs and relevant comments are presented on Table 5.

One approach considered was to demolish the structures and excavate all soils over the full extent of the Time Oil and Fleetline properties and the Burlington Northern spur to a depth of 30 feet (approximately the depth to the groundwater table.) The excavated soil would be disposed of either in a RCRA permitted facility off-site or in an on-site facility. On site disposal would be less expensive in this case. However, on-site disposal was rejected because of limited space which would affect construction activities. In addition, the cost of on-site disposal, while less than that of off-site disposal, is extremely high for the deep excavation option.

Capping of all of the contaminated soil in place was evaluated and rejected. Surface land uses prevent construction of the surface cap laterally beyond the edges of the contaminated soil to an extent sufficient to guarantee that infiltrating precipitation might not move laterally into contact with the contaminated soils. Therefore, the possibility exists that long-term intermittent leaching of the contaminated soil may occur. Furthermore, the presence and continued use of the railroad spur would make it difficult to construct and maintain an effective cap, providing further potential for leaching.

Treatment of all of the contaminated soil by flushing with no excavation was also evaluated. The uppermost 5 feet of soils under and adjacent to a portion of the spur are contaminated with an oily, fine grained filter cake which resulted from oil recycling operations on the site. This material, which is visually identifiable by its dark color, contains high concentrations of organic solvents. Because of its oily, fine grained (clay-like) nature, this material is expected to resist cleansing by flushing.

Because treatment by flushing is considered to be effective for some but not for all of the contaminated soils, the alternative of removal of a portion of the soils and flushing of the remainder was evaluated. The discolored (oily, fine-grained) soils and filter cake under and adjacent to the railroad spur, plus one foot, are to be excavated and disposed of off-site. The rationale for removing these materials is that flushing of the underlying soils is planned, and it does not appear that these oily, fine-grained materials would submit well to that form of treatment.

Certain soil test borings (SB-003 and DB-005) indicate the presence of high solvent concentrations below the discolored zone. Additional excavation would then be conducted in those areas where small incremental increases in soil excavation would then produce relatively larger increases in solvent removal. Removal of the additional material would increase the reliability of soil flushing and would reduce the time of treatment to achieve any given level of cleanup. Depths of soil excavation will be based on soil test borings and be approximately 5 to 6

feet along much of the railroad spur and possibly up to 12 feet near soil borings DB-005 and SB-003. The piping for the soil flushing system will be installed in excavated areas. Permeable backfill will be placed to protect the piping and to prevent direct human contact with the underlying soils during the flushing process.

An alternative to leaching the contamination from the soil with water would be the use of in-situ soil aeration to remove the volatile contaminants. The site specific feasibility of this alternative will be evaluated when data from additional soil borings is obtained.

As mentioned, the soils elsewhere on the Time Oil and Fleetline properties have low concentrations of contaminants distributed throughout the soil column. It is proposed that these soils be left in place and covered and that they later be addressed in a manner consistent with those at the railroad spur when the close-out requirements are determined. Additional borings are planned during the design phase. Should pockets of highly contaminated soils be found at depth in other areas of the site, they would be dealt with in a manner similar to the soils at the railroad spur.

The decision regarding the final cover or capping of the site would be made at the point when the endpoint level of groundwater treatment is established. The need for and design of the cover would be based on any residual soil contamination.

Summary of Recommended Option

The recommended option contains the following elements:

At the railroad spur and the adjacent areas of the parking lot, excavation will be performed for the visually contaminated soils plus one additional foot. There will also be additional soil excavation in areas where high levels of contamination are found.

It is intended that soil flushing at the spur will continue until the remaining contaminants pose no further threat to the groundwater and therefore, it will not be necessary to cap the site. However, no recommendation is made at this time as to the soil contaminant concentration which will achieve this goal. The soil cleanup level will be addressed in a later decision.

Limited excavation of the visually contaminated materials is recommended because of the resistance of such materials to treatment by flushing. Excavation of small amounts of additional highly contaminated soil is based upon the enhanced reliability of the soil flushing system and the fact that excavation of these soils is expected to reduce the period during which the soil flushing and the groundwater treatment system must be operated to reach a given level of cleanup.

Lesser contaminated soils of the site will be paved or covered with uncontaminated soil as an interim remedy to prevent direct contact with the contaminated soils. A determination of whether additional steps may need to be undertaken as a permanent remedy for these areas will be made in conjunction with the determination of an appropriate cleanup level for the areas to be treated by flushing.

The recommended remedy includes the construction of a groundwater treatment system consisting of an extraction well(s) at the source area, treatment of the extracted water by aeration and the discharge of the treated water to Commencement Bay. Although the appropriate level of groundwater treatment has not been determined at this time, EPA believes that the installation of such a treatment system at the site is cost effective and necessary to protect health and the environment for several reasons: operation of the groundwater system is necessary to eliminate a large amount of heavily contaminated groundwater near the site and beyond; operation of the system is also expected to substantially reduce the period of time during which the treatment system at Well 12A will need to be operated; and the treated water is an integral part of the soil flushing remedy.

The appropriate final groundwater treatment level will be determined as additional information is gained through operation of the system.

Based upon present data, the recommended remedy does not include carbon adsorption treatment of the solvents released from the aeration treatment. The release of solvents in the quantities expected will not pose a threat to health or the environment. Should it be determined that the release will be inconsistent with the protection of health or the environment, the Regional Administrator shall have the authority to approve modifications to the system and/or its operations, including carbon adsorption, to mitigate any threat.

The Regional Administrator shall also have the authority to approve changes in the treatment of on-site soils to other methods, including soil aeration, which are found to be equivalent in cost and effectiveness of the method. ~~The~~ feasibility of other treatment methods may be evaluated during the design of the remedial action.

CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

All facets of the proposed action will be consistent with with the technical requirements of other environmental laws. The off-site transportation and disposal of contaminated soils will be in accordance with appropriate Resource Conservation and Recovery Act (RCRA)

regulations, including manifesting of wastes and shipment to a RCRA approved facility. No determination has been made as to whether the material excavated will be disposed of in a single or double lined facility. Operation of aeration towers for the treatment of contaminated groundwater will be conducted consistent with the appropriate Clean Air Act regulations for emissions of volatile organics into the air. The discharge of treated groundwater to navigable waters will be consistent with the Clean Water Act.

Safe Drinking Water Act--There are no drinking water standards for the contaminants present at Well 12A. Groundwater from Well 12A, intended to be used as drinking water, will continue to be treated to the 10^{-6} risk level for the contaminants present.

Clean Air Act--The Puget Sound Air Pollution Control Agency (PSAPCA) controls air discharges. A permit has been issued for the Well 12A treatment facilities. PSAPCA must be notified of any changes to the facility or operating conditions that would increase the discharge. The air stripping towers at the extraction well (at the source) will meet all technical requirements for an air discharge.

RCRA- The decisions regarding closure of the site and the level of groundwater quality to be achieved are deferred. In order to be consistent with 40 CFR 264 Subpart F of the regulations, groundwater corrective action is required until the concentration of hazardous constituents at the point of compliance for a site achieves one of the following: Maximum Concentration Limits (MCL), where designated for particular substances; an Alternate Concentration Limit (ACL), which would provide adequate protection of public health and the environment; or background levels.

EPA is not prepared at this time to determine the appropriate level of groundwater corrective action at this site. Operation of the groundwater treatment system for two years will substantially reduce the

amount of contaminants in the groundwater in the vicinity of the source and would reduce the plume of contaminated groundwater which exceeds the 10^{-6} risk level previously established for Well 12A. Using data and information collected in that period, EPA would make a determination as to the level of contaminants which would adequately protect health and the environment. Under CERCLA, the groundwater treatment system would be operated until this level of treatment is achieved unless that level proved technically infeasible or placed an unreasonable burden upon the Fund.

Where RCRA closure regulations are applicable, they would require that all hazardous wastes at a site be removed, treated on site or capped in such a way as to minimize the migration of contaminants from the site. At this site, certain oily and other heavily contaminated soils would be excavated, transported and disposed of offsite in accordance with RCRA regulations. Other contaminated soils underlying the excavated areas would be treated by flushing. While the areas would not be capped immediately in accordance with RCRA, the backfill, paving and cover in other areas should adequately address direct human exposure during treatment.

In conjunction with the establishment of a groundwater treatment level, EPA would evaluate the level of contaminants which could be left in the soil without the necessity of a cap at the site.

OPERATIONS AND MAINTENANCE (O&M)

Activities

Near Source Extraction System and Well 12A System

- Daily equipment flow, pressure, temperature logging, and general equipment observation.
- Weekly inlet/outlet water sampling and analysis for VOC's.
- Annual fan and pump maintenance inspection per manufacturers' instructions.
- For 12A system only, periodic packing chlorination, and seasonal shutdown and startup procedures.

Monitoring Wells

- Approximately monthly sampling and analyses for VOC's.

Surface Cap

- Monthly inspection and repaving as necessary

Reporting

- Approximately bimonthly consolidation and reporting of 12A, near source, and monitoring well data.

Future Actions

As outlined under O&M:

- Operate and maintain near source extraction system year round.
- Operate and maintain Well 12A facility. Estimated four months a year operation.
- Sample and analyze existing monitoring wells, evaluate and report progress of cleanup.

SCHEDULE

Approve Remedial Action 9/84

Initiate Negotiation with PRPs 9/84

Negotiation Successful		Negotiation Unsuccessful
Sign EDD, Consent 106 AO	3/85	Unilateral 106 AO effective Sign ROD, IAG
Design Initiated by PRPs	2/85	
	2/85	Design Initiated by EPA
Construction Procurement by PRPs	5/85	
	9/85	Construction Procurement by EPA
Construction Initiated by PRPs	7/85	
Construction Completed by PRPs	10/85	Construction Initiated by EPA

RESPONSIVENESS SUMMARY
SOUTH TACOMA CHANNEL SITE
(PUBLIC WELL 12A)
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

Part I

Introduction and Overview of the Public Meeting

A public meeting was held at the Tacoma-Pierce County Health Department auditorium on July 25, 1984, to discuss the Remedial Investigation/Feasibility Study (RI/FS) report for the South Tacoma Channel Site (Public Well 12A) and to accept public comment. The meeting, which was attended by approximately 20 persons, started at 7:00 p.m. and ended at 7:45 p.m.

A press release was issued in late June to announce the public meeting. A fact sheet summarizing the RI/FS report was mailed to more than 300 individuals and organizations in late June. The RI/FS report was available for public review at the Tacoma Public Library, Tacoma-Pierce County Health Department, and Tacoma Department of Public Utilities. The public meeting was well covered by the media.

The meeting was chaired by Philip Wong, Site Manager for the project. He was assisted by Dr. Chuck Shenk from EPA's Superfund Program, and by Bob Schilling from CH2M HILL, the project consultant.

Mr. Wong briefly described the site history, the nature of the problem, the initial remedial measure conducted in 1983, the cleanup options that were considered, and the recommended alternative. He then called for questions and comments from the audience.

Five speakers offered questions or comments. The questions generally asked for clarification of various aspects of the cleanup options and the recommended alternative. The Washington Department of Ecology stated its support for the recommended alternative which included shallow excavatyion of the soil at the spur and other areas of the site and the extraction and treatment of the groundwater beneath the site. Mr. Wong stated that EPA has also received endorsement from the City of Tacoma Water Department and the Tacoma-Pierce County Health Department. All three agencies recommend implementation to occur as soon as possible.

Mr. Wong announced that the public comment period is open until August 1, 1984, and that EPA encourages written comments. All comments will be considered in the decision process, and a written response to the comments will be included in the Record of Decision. According to the current project schedule, final project approval will occur in September 1984 and design will begin soon after that. Project implementation is projected to begin in Spring 1985.

The following is a summary of the questions and comments made during the public meeting. The paraphrased responses to those questions and comments are included. In addition, further responses to several of the questions are provided in Part II of this summary.

Summary of Public Comment and Agency Response During the Public Meeting

1. Comment/Question: Why are Options 1 and 2 so close in cost, although Option 1 does so much more?

   Response: Under Option 1, the extraction facility and the Well 12A air stripping towers could probably be shut down after five years of operation. Under Option 2, the Well 12A stripping towers would have to operate for as long as 100 years to remove the contamination. The present worth cost of Option 2 results from the operation and maintenance costs associated with operating the stripping towers over a long period.

2. Comment/Question: A representative of the Washington Department of Ecology (DOE) stated DOE's support of Option 1 and requested EPA to proceed rapidly toward the detailed design of that option. DOE believes the pumping/treatment system should be the first step, followed by detailed evaluation of the soil contaminants.

3. Comment/Question: Mr. Wong stated that EPA has also received endorsement of Option 1 from the City of Tacoma Water Department and the Tacoma-Pierce County Health Department. These agencies recommend that implementation occur as soon as possible.

4. Comment/Question: Where did the contaminated fill material along the railroad line originally come from? Is it possible that the same material was used at other sites where a similar problem could arise in the future?

   Response: The fill material was probably not imported; it was contaminated in place. It is very difficult to track it because it could have been put there decades ago. The National Oil Company operated on that site and deposited sediments there for a number of years. At some point, solvents got mixed in with those sediments; they were either a part of a grossly contaminated batch of used oil or were dumped on top of the oil sediments to dispose of them. The National Oil Co. stored a lot of solvents on site. That may be how much of the ground on adjacent facilities, as well as along the railroad tracks, became contaminated. But at this point, it is speculation because it happened so long ago.

5. Comment/Question: Is all the work for this site funded with Superfund money? And who makes the final decision about which option is selected?

   Response: So far, all funding has been Superfund money, with the state paying 10 percent for the cost of the towers. At this point, additional work will also be funded by Superfund, pending any kind of negotiated settlement with the responsible parties.

   EPA, in conjunction with the state and local agencies that are involved, will decide which option is selected. So far, there seems to be agreement that Option 1, that is, shallow soil removal and groundwater extraction and treatment, is the best alternative. EPA will further consider the options following the public meeting and the comments received from the public and involved agencies.

6. Comment/Question: Is there any other option for providing a water supply, such as closing these wells and drilling someplace else at a lesser cost?

   Response: The problem is that it is not just a matter of abandoning only Well 12A or Well 9A. When 12A was shut down, 9A became contaminated; when 9A was shut down, there was evidence of contamination moving toward Wells 2A and 11A. This could occur all the way down the well field. To abandon the entire well field and drill again would be a much more expensive, and not necessarily reliable, option. The well field provides up to 40 percent of the city's water during the summer. No more water can be taken out of the Green River. The city has been drilling test wells to look for other sources of water for the past few years, but has found nothing that could provide as much water as is needed.

7. Question/Comment: What volume of airborne pollution would result from using the new stripping tower to clean the ground water?

   Response: About 40 lbs. a day of solvents are released into the atmosphere from the existing Well 12A stripping towers. That is equivalent to the amount of solvents released into the air by two gas stations. The stripping towers operate only during the summer, while gas stations operate year-round, so the towers are a minor contamination source. Under worst-

case conditions, the concentration of solvents occurring a short distance downwind from the towers would be only one ten-thousandth of the concentration allowed by OSHA for 8-hour occupational work. The stripping towers have an operating permit from the Air Pollution Control Authority. The new stripping tower would be smaller and would have much more concentrated material coming into it than the 12A towers. It would release about 200 lbs. of solvents per day into the atmosphere for the first few weeks. Within six months, the amount would be equivalent to 12A, and then would continue to decrease as the groundwater is cleaned up through the stripping process.

8. Comment/Question: Is it correct that the contamination that goes into the air will eventually come back down into the water supply again, only not in a dangerous concentration?

   Response: It does come back down to the ground in a widely dispersed form. Fortunately, it naturally deteriorates, so when it is exposed to air and sunlight, the solvent disintegrates.

9. Question/Comment: What was the initial reason for EPA's involvement at this site? Were specific illnesses reported? If not, why is EPA proceeding if there is no evidence that anyone is actually being harmed?

   Response: EPA undertook a national sampling program of public drinking water wells in 1981. Either the health department or the state recommended that EPA look at this site because it was in a highly industrialized area and there was some concern about nearby firms. Testing in 1981 revealed high levels of contamination.

   There is no evidence at this time that people in this area have suffered ill effects from the drinking water. However, two of the contaminants are known carcinogens. The main contaminant, 1,1,2,2-tetrachloroethane, is the most toxic chlorinated solvent and has been banned from many countries because of its extreme toxicity. We know that it causes liver damage and other acute effects if people are exposed to massive doses of it. However, it is difficult to know the problems that would result from drinking small amounts of it over a long period of time. We have the same problem with most of the chemicals we deal with. No studies have been done on people, and we have to extrapolate from studies on laboratory animals. We are uncertain at this time how much effect these contaminants may possibly have had on people in this area.

The State of Washington and the local health department have established what is called a 10-6 risk level for these contaminants. Based on the information we currently have, this means that if 1,000,000 people were to drink two liters a day of water that contains this level of contaminant, one person would contract cancer from this exposure. That is the level we are cleaning the water up to, as set for us by both the state and the county.

10. Question/Comment: What are the criteria for removing the contaminated soil? How did you arbitrarily pick an excavation depth of 5 feet?

    Response: We picked a depth that would remove most of the contaminated railbed material. Five feet was used as a basis for estimating comparative costs. We recommend that for the conceptual design, excavation depth is based on reducing the contamination to a certain level. We want to mitigate the hazard to people that might result from direct contact with or inhalation of contaminants. Air monitoring at the site has shown no problem with air contamination. However, direct contact is a hazard because tetrachloroethane can be absorbed through the skin. The material is highly contaminated; some of it has been about 3 percent tetrachloroethane, which is a large amount. We are also concerned that if it is allowed to remain there, it could filter down to the groundwater and be a continual contamination source.

11. Comment/Question: If the tetrachloroethane can leach through the soil into the groundwater, couldn't it then be treated through air stripping? Only 600 lb of contaminants have been identified from this source, versus 10,000 lb already in the groundwater. I suggest this as an alternative because removal of the soil is estimated to cost $500 per cubic yard.

    Response: We want to make sure we get rid of the worst contamination, so we do not have another problem in the future from what has been left behind.

12. Comment/Question: Does EPA feel satisfied with the fact that soil borings were not necessarily located around Time Oil and some other areas that could have generated the waste? Do more soil borings need to be taken?

Response: It is possible that additional information will be needed during the soil removal to ensure that all contaminated areas have been reached. We do feel, however, that our data from the monitoring wells has pretty well defined the contaminated area, and that the source does not extend much further. We did take some surface samples from the other side of the tracks and around the areas that were most contaminated, and found no evidence of anything there.

Conclusions About the Meeting

The questions asked at the meeting generally requested clarification of various aspects of the cleanup options and the recommended alternative. The Washington Department of Ecology, City of Tacoma Water Department, and Tacoma-Pierce County Health Department support Option 1, the recommended alternative and urged implementation as quickly as possible.

Part II

Supplementary Responses to Comments Received at the Public Meeting

EPA has reviewed the comments raised at the public meeting, and the responses made at that time. Based on that review, and with knowledge of the final remedy recommended for this site, EPA believes it would be useful to expand upon or clarify serveral of the responses presented at the public meeting.

Comment/Question 9

For the on-going treatment of the water pumped from Well 12A, EPA and the State of Washington selected the 10^{-6} risk level as the appropriate criteria to assure that users of the well were adequately protected.

For this remedial action, EPA has not selected a cleanup endpoint for contaminated groundwater at the source area. EPA will initiate a groundwater pumping and treatment program, and will select a concentration limit which will provide adequate protection of human health and the enviornment, considering the particular factors associated with this site. The choice of a treatment level will be based in part on experience with the first two years of operation of the groundwater treatment and soil flushing system.

Question/Comment 10

The decision to excavate contaminated soil was initially based on the fact that it would be very difficult to flush the solvents from the oily soils near the surface. For this reason, EPA selected its soil cleanup criteria based on the presence of soils which were visibly contaminated with oily

materials. It is believed that removal of such visibly contaminated material would allow the soil flushing to be carried out successfully. For the purposes of estimating costs, the 5 foot level was used to represent the approximate lower bound of the visibly contaminated soil.

EPA has also determined that some soil immediately below the visibly contaminated zone generally contains a relatively high concentration of solvents. Although it is difficult to precisely predict the effect of removal of this additional material, EPA believes that excavation of an additional one foot (approximately) of the most heavily contaminated soil will increase the reliability of the groundwater treatment/soil flushing system, and reduce the amount of time that the system must be operated to reach any given level of protection for soil and groundwater. In addition, as was discussed at the meeting, excavation of surface material will prevent direct contact with contaminated materia.

Comment/Question 11

EPA is excavating and removing only the visibly contaminated soil, which would resist flushing, and a small additional amount of the most heavily contaminated material. The bulk of the contaminated soil will be addressed by flushing the contaminants into the groundwater, which will be pumped and air-stripped to remove the contaminants.

Part III

Post Meeting Written Comments

In addition to the comments received at the meeting, written comments were received from three agencies and two private companies. As noted earlier, the Washington Department of Ecology (WDOE), the City of Tacoma Public Utilities Department and the Tacoma Pierce County Health Department all urged that the selected remedial action be implemented as quickly as possible. The Public Utilities Department also emphasized the importance of the aquifer to the City as a part of their future water supply base.

The WDOE submitted a number of comments concerning continued operation of Well 12A, the proposed water treatment system at the source, cleanup and construction at the site, review of site history, monitoring and modeling. Several of the Department's comments have already been considered by EPA. Many of the other comments will be addressed during the design phase of the project. In addition, EPA will involve the Tacoma Utilities Department, the Tacoma Pierce County Health Department and the Washington Department of Social and Health Services in these discussions.

Two of the identified potentially responsible parties requested a 60 day extension to the public comment period. EPA did not extend the comment period but agreed to allow the parties additional time to respond to the RI/FS in conjunction with the negotiation process provided specific conditions and deadlines would be met. Copies of the requests and EPA's responses are attached.

Time Oil responded to the RI/FS by questioning the validity of assumptions used in modeling groundwater behavior and finding fault in the basic interpretation of data. Time Oil concludes that insufficient data has been produced to declare their property as a major source of contamination of Well 12A and that insufficient work has been conducted to locate all potential sources.

EPA has responded by pointing out that modeling was used as a supplementary tool of investigation and that the same conclusions would be reached from direct observation of the data. EPA maintains that the data clearly identifies the Time Oil properly as a major source of contamination and that it does not indicate any major source beyond the Time Oil/Burlington Northern site.

Burlington Northern has questioned the sufficiency of data, the cost effectiveness and cost estimates of EPA's proposal and states that the Burlington Northern property is not a contaminant source and that the company is not a responsible party under CERCLA.

EPA has responded in pointing out that the data clearly demonstrates that Burlington Northern property contributes contaminants to the groundwater beneath the site. Many options were evaluated and developed. The selected alterative is one which adequately meets the criteria and goals of remediation for the source area.

The PRPs, especially Time Oil Company, and their consultants have provided EPA with a number of documents presenting proposals and critiquing the RI/FS. Some of the principal documents and responses from EPA contractors are listed below and are attached as part of the Responsiveness Summary:

Report entitled , "Evaluation of Studies Conducted for U.S. EPA on South Tacoma Channel, Tacoma, Washington. Part I of Two Parts, dated August 31, 1984, by Cor Star, Inc.

Report entitled , "Evaluation of the Groundwater Flow System in the South Tacoma Channel Area, Tacoma, Washington. Part II of Two Parts, dated September 14, 1984, by Cor-Star, Inc.

Letter, dated October 30, 1984, from John Varnum (Time Oil's counsel) to Chuck Shenk (EPA-X).

Letter, dated November, 6, 1984 from Charles Findley (EPA Region 10) to each of the PRPs.

Memorandum, dated November 28, 1984, from John Varnum (Time Oil's counsel) to EPA Region 10 responding to the November 6, 1984, letter.

Petition, dated November 28, 1984, from John Varnum (Time Oil's counsel) to William Ruckelshaus (EPA-HQ) with attachments, requesting modification of the NPL listing of the Tacoma Well 12A site.

Letter, dated January 4, 1985, from CH²M Hill to Phil Wong (EPA Region 10) addressing contents of PRP materials and reports.

Letter, dated February 13, 1985, from CH²M Hill to Phil Wong further addressing the PRP materials.

During the course of the negotiations conducted during the Fall, 1984, the PRPs raised a number of technical points regarding the results presented in the RI/FS, especially the description of the site-specific geohydrology. The detailed technical arguments are found in the previously listed reports, letters and memorandums, and a brief summary is provided below.

The PRPs have argued that the site (Time Oil and Fleetline properties) could not possibly be the source of contamination at Well 12A because a groundwater divide forms between the site and Well 12A when the well field is pumped. Their contention that the groundwater divide forms is based principally on the results of a groundwater modeling effort prepared by their consultants. They further question certain aspects of the set-up, calibration and operation of EPA's model (which does not show the presence of a divide). EPA's consultant has re-examined the data and use of the model and has responded that EPA did not rely heavily on a model at this stage of the investigation, and furthermore, the presently available data do not indicate the presence of a permanent divide between the site and Well 12A. It should be noted that the assumptions built into a model greatly influence the output, and the ultimate test of model validity is the extent to which the predicted results agree with the data.

A second general line of argument raised by the PRPs is to question whether the site is the only, or primary, source of 1,1,2,2-tetrachloroethane contamination. They cite differences in the ratios of 1,1,2,2 tetrachloroethane to trichloroethylene between the site and Well 12A, the time from start-up of pumping at Well 12A until peak concentrations are reached, and alternative interpretations of concentration contours. EPA's consultant has reviewed these and other comments, but points out that the presence of the highest concentrations of 1,1,2,2-tetracholorethane in the immediate vicinity of the site tends to link the site and Well 12A. Further, explanations responding to the PRP comments are available which continue to support the interpretations of the EPA. The reader is referred to the letters from CH2M Hill, dated January 4, 1985, and February 13, 1985, for further discussion of the merits of the RI/FS and the PRP comments.